26TH LEATHER RESEARCH-INDUSTRY GET-TOGETHER
25 - 27, MARCH 1991

U-13

IMPACT OF CHANGING GLOBAL ECONOMIC SCENE ON INDIAN LEATHER INDUSTRY IN RURAL AND ORGANISED SECTOR

CENTRAL LEATHER RESEARCH INSTITUTE
(Council of Scientific & Industrial Research)
ADYAR, MADRAS – 600 020, INDIA

Organised By

Central Leather Research Institute (CLRI)
(Council of Scientific and Industrial Research)

in association with

Council for Leather Exports
(CLE), Madras

All India Skin and Hide Tanners and
Merchants Association (AISHTMA), Madras

Indian Leather Technologists Association
(ILTA), Calcutta

Indian Leather Products Association
(ILPA), Calcutta

Indian Chamber of Leather Industry
(ICOLI), New Delhi

Small Scale Leather Industries Federation
(SSLIF), Bombay

Department of Science and Technology
(DST), New Delhi

Committee on Science and Technology in
Developing Countries (COSTED), Madras

Conveners:

Shri J.K. Khanna, Scientist, CLRI

Shri K.Sarjuna Rao, Scientist, CLRI

Central Leather Research Institute Press
Adyar, Madras - 600 020, India

FOREWORD

The Tanners' Get-together (TGT) has served a forum for Leather Research-Industry Get-together for 25 years. In response to the wishes of the industry, TGT has now been rechristened as Leather Research-Industry Get-together (LERIG). It is being held at the Central Leather Research Institute (CLRI), Adyar, Madras (India) during Mrach 25-27 1991.

The LERIG 91 is being jointly sponsored by the Central Leather Research Institute (CLRI), Council for Leather Exports (CLE), All India Skin and Hide Tanners and Merchants Association (AISHTMA), Indian Leather Technologists Association (ILTA), Indian Leather Products Association (ILPA), Indian Chamber of Leather Industries (ICOLI), Small Scale Leather Industries Federation (SSLIF), Department of Science and Technology (DST) and The Committee on Science and Technology in Developing Countries (COSTED). This represents a landmark where the Government, the Industry and the Research Institute plan a common forum to discuss important Indian Leather Industry.

Changes in the political structure and economic scene at the global level have been vast during the last one year. Export oriented Indian leather sector may expect a large impact due to the changes in the global scene. The possible roles of leather sector in strengthening the rural employment base and economy have attained national significance. These call for better preparedness in terms of both policies and technological options. There will be three sessions to discuss the policies, plans and trends in LERIG 91.

The first technical session deals with the changing global economic and political scene and its likely impact on the leather industry with special reference to Indian leather industry.

The second technical session is dedicated to Baba Saheb Dr B R Ambedkar's memory on his birth centenary celebrations. It would deal with the development of leather industry in the rural sector and contribution of CLRI in this area.

The third technical session would deal with alternate technologies and techniques for leather industry. Enzymatic unhairing using **Clarizyme** an enzyme developed by CLRI, process control for small leather unit and chrome recovery and reuse.

The first session would be followed by a panel discussion. A series of demonstration programmes are included in LERIG 91 to enable leading manufacturers of leather, chemicals and computer software to enable show-how for a new range of technologies/techniques/products. The poster session mainly brings out recent research findings and other technological developments in the leather and allied fields even in early stages of R & D.

Prof. Y Nayudamma Science Foundation Day Lecture for this year would be delivered by Dr S R Valluri,a distinguished scientist in the field of aeronautics S&T on 26th March. Dr H A B Parpia, a distinguished scientist in the field of food S&T would ddeliver the Dr B M Das Memorial lecture on 27th March.

The LERIG has traditionally provided an opportunity for the tanners and scientists to exchange views, renew contacts and impress jointly on the policy makers to evolve suitable measures for the overall promotion of the Indian leather industry. The LERIG 91 aims, in addition, further strengthening of institute-industry linkages.

22 March 1991

(Dr.G.THYAGARAJAN)
Director

CONTENTS

SESSION I: CHANGING GLOBAL ECONOMIC AND POLITICAL SITUATION AND ITS IMPACT ON THE LEATHER INDUSTRY

SESSION-II DEVELOPMENT OF LEATHER INDUSTRY IN THE RURAL SECTOR

SESSION-III ALTERNATE TECHNIQUES AND TECHNOLOGIES FOR THE LEATHER INDUSTRY

POSTER SESSION

26th LEATHER RESEARCH – INDUSTRY GET–TOGETHER (LERIG), 1991
CENTRAL LEATHER RESEARCH INSTITUTE
ADYAR, MADRAS – 600 020, INDIA
PROGRAMME

	09:30–10:30 Hrs.	11:00–13:30 Hrs.	14:30–17:30 Hrs.
	INAUGURATION & SPECIAL LECTURES	TECHNICAL SESSIONS	PRACTICAL DEMONSTRATIONS & POSTER SESSION
25th March 91 Monday	INAUGURATION H.E. The Governor of Tamil Nadu Shri Bhisma Narain Singh Shri Sanjoy Sen Presides Shri M M Hashim Releases the Souvenir	Changing Global Economic & Political Situation and its Impact on the Leather Industry Chairman: Shri D Sridharan; Rapporteur: Shri N Lakshminarayanan SPEAKERS Shri R S Chambers, Consultant — Shri D Sridharan, AIM Shri K S Rao, CLRI — Shri S Bhattacharyya, DST PANEL DISCUSSION Shri S Nagarajan — Shri P Prabhakaran Dr C K Rao — Shri Sanjoy Sen Shri R Satapathy — Shri C K Duraivelan	Shri T S Krishnan Inaugurates DEMONSTRATIONS – Colour Chem – Chemcrown – Atul Products
26th March 91 Tuesday	NAYUDAMMA SCIENCE FOUNDATION LECTURE Dr S R Valluri Speaks on Self–Reliance in Technology Dr G Thyagarajan Presides	This Session is Dedicated to Dr B R Ambedkar's Birth Centenary Celebrations Development of Leather Industry in the Rural Sector Chairman: Prof B D Tilak Rapporteur: Shri Mahendra Kumar SPEAKERS Shri P N Choudhury, KVIB(WB) — Shri Kamal Taori, KVIC Shri T S K Mahadevan, CLRI — Shri K Muniyandi	DEMONSTRATIONS – S M Zechimmer & Schwarz – CLRI (Process Control Operations)
27th March 91 Wednesday	B M DAS MEMORIAL LECTURE Dr H A B Parpia Speaks on Integrated Development of Meat & Leather Industries Shri A Hafeezur Rehman Presides	Alternative Techniques and Technologies for the Leather Industry Chairman: Shri M M Hashim Rapporteur: Shri C Muralidharan SPEAKERS Dr K S Jayaraman – Enzymatic Unhairing Dr K V Raghavan, CLRI & Dr P E Sankaranarayanan, CEERI – Process Control for Small Leather Units Dr S Rajamani, CLRI & Shri J E Schaapman, Hoekoning – Chrome Recovery and Reuse	Computer Assisted Leather Processing AT HOME

Timings: 09:30–17:30 Hrs. Lunch: 13:30–14:30 Hrs. Tea/Coffee Break: 10:30–11:00 & 15:30–16:00 Hrs.

SESSION I

Changing global economic and political changes and its impact on the Indian Leather Industry

THE CHANGING GLOBAL ECONOMIC AND POLITICAL SCENE AND ITS LIKELY IMPACT ON THE INDIAN LEATHER INDUSTRY

R S CHAMBERS
COMMONWEALTH FUND FOR TECHNICAL COOPERATION, LONDON

INTRODUCTION

Global Economic and Political changes are having increasing effects on trade and industry. With industrial operations becoming more international and trade between industrial countries increasing, rapid changes in the economic and political scenes demand rapid responses to the situations.

With the decline in livestock production and an increasing demand for leather products in developed countries leading to wholesale trading of the raw material between developing and developed countries, hides, skins and leather have become internationally traded commodities, with India being one of the main participants in the business. Therefore, in this paper, indications are given of the possible effects of the more recent changes in the international scene under four topical headings:

1 Gulf Crisis
2 G.A.T.T. - Uruguay Round
3 Green Politics
4 Glasnost

which may be regarded as the 'G' Factors of the current international scene.

1. Gulf Crisis

At the time of preparing this paper the situation in the Gulf was still very uncertain. With the UN deadline of the 15 January having passed and the only sounds and messages coming from Iraq and the International coalition being warlike. Those diplomatic manoeuvres have now failed and there is a state of conflict in the region which makes prediction of its effects on the Indian Leather Industry and Global economics all the more difficult.

As an example of how difficult it is to monitor economic indicators, at 12.00 noon on the 17 January 1991, i.e. the first day of hostilities, the following occurred:

Financial Times 100 shares index on the London Stock Exchange rose 70 points

The Sterling gained 2 cents against the dollar

The price of oil fell US$7.00 per barrel a reduction of nearly 25%

While only goes to show how speculative financial and oil analysis is.

Prophesying the effects of a war, particularly when, it is not clear what would constitute a victory, may seem rash. But people are understandably nervous about the possible economic fall-out, and some of those people represent the worldwide customers for Indian Leather. The major factor to consider is that of the likely effect of oil prices and their upward spiral, on the economies of India's principal customers in the world and also India's own domestic economy; and the effects on competitiveness of Indian leather goods in the market place.

There are currently widely differing forecasts for oil prices but an average of these predictions would seem to be that if it is a short war of up to a one month a price increase from current levels of US$29.20 per barrel to US$37 is likely but a long war of over 3 months would force the price to at least US$50 per barrel. However, market movements since the 17/18 January emphasise the uncertainty and volatility of the situation. If there is grave damage to oil production in the Middle East the oil analysts seem to agree that is impossible to predict how far prices will soar.

The Macro view would suggest that the result of both levels of price increase would be an increase in the inflation rate followed by falls in that rate as the deflationary aspects of higher oil prices make themselves felt throughout industry. Recession would deepen and the rise in unemployment would be serious with the effects on world economies being grim. From the micro viewpoint the important influence on the Indian leather industry would be the costs of imported oil based tanning chemicals and vastly increased transportation costs caused by the rise in price of aviation fuel. These will have a significant impact on tanning and marketing costs which Indian tanners will have to

pass on to their increasingly hard pressed overseas customers. Increased costs will be further compounded by the airfreight routes being lengthened, due to prohibition of overflights in certain areas, which will disadvantage any exporting country such as India with its long supply routes to its customers.

Should any of the threatened terrorist activity escalate away from the centre of conflict the effects would be difficult to quantify, but it is certain that shipping insurance costs would rise alarmingly, which would represent yet another additional burden for the leather exporters of India to absorb in their costings. Importation of any tanning machinery, spare parts or essential expertise would be subjected to constraints and would also be liable to increased prices.

The only redeeming factor is that the effects will be global and that all competitors will be disconcerted to the same degree, in respect of local costs.

Whatever the outcome of the confrontation in human terms, dreadful and appalling as they may be, the economic effects are very important to the Indian leather sector. One can only hope with the rest of the world that a speedy resolution to the crisis is achieved and that the already difficult business of selling leather can be allowed to progress in a peaceful environment.

2. G.A.T.T. "Uruguay Round"

An equally important macro influence on global trading, with particular reference to Indian leather and leather products, which has become overshadowed by the Gulf situation has been, and is, the failure so far of the member nations of the General Agreement on Tariffs and Trade to reach agreement on the current "Uruguay Round" of multilateral trade negotiations.

Leather garments and footwear, both of which represent a major part of India's end user customers of leather, have been subject to an increasing degree of protectionism through a proliferation of tariff and other restrictions including informal quotas applied outside of GATT auspices. These are being addressed in the Round. The main reason why success has evaded the negotiators so far is their inability to agree on the coverage, timetable and depth of cut of subsidies for producing and exporting

agricultural products or on the degree of market access to be afforded. The USA and the Cairns Group of agricultural free traders have failed at present to convince the EEC to revise its present offer sufficiently to constitute a basis for negotiations. The Community considers that to do so would jeopardise its Common Agricultural Policy (CAP), one of the main foundations of the Common Market. Although the CAP is under reform, the changes are unlikely to be sufficiently substantive or, even more important, agreed upon quickly enought to save the Round. This in itself does not actually involve the leather sector but without agreement on agriculture all areas of trade may be affected by any ensuing expansion of protectionist measures. The Round has been suspeded, not abandoned, but as of now, no agreement on agriculture is in sight. It is impossible to forecast what the outcome will be for the Indian leather industry, but, of course, any form of protection of potential or existing markets cannot be beneficial to an export based industry.

It is not clear what India's stance would be regarding the export of finished leather products in any resumption of negotiations. But it seems that protectionism in the USA and Europe could increase unless early agreement can be reached within GATT.

The same is true of leather in its various forms - raw, semi processed or finished. Several of the officials negotiating on behalf of the EC are very reticent to disclose anything officially, but the speculation is that difficulties still remain in the technical areas associated with world trade in leather, despite broad agreement on the proposed depth of tariff cuts to be made, (one-third in most cases).

The treatment of subsidies still causes great concern, especially in regard to exports (or lack thereof) of raw stock from developing countries. Where exports do occur, the price differentials between export and domestic markets are too often claimed to represent "effective subsidies".

Market access and so called trade distortions have been high on the agenda of discussion, but is seems that the EEC side are confident that the Indian Government is fully cognisant with what is needed and are actively seeking a positive solution.

It is also reliably understood that the German representatives in the EEC team are also keen to introduce environmental considerations into the framework of talks.

It will not be possible to discuss all the ramifications of the very delicate GATT negotiations, but suffice it to say that a successful continuation is vital to the future plans and aspirations of the Indian leather industry.

3. Green Politics

The third G Factor is that of the "GREEN" movement world wide.

Green politics have come of age in the last decade and have created a global awareness of ecological and environmental issues.

This environmental consciousness has fostered consumer led pressure on manufacturers of a whole range of products to "clean up their act" in regard to pollution creating processes. It has also forced manufacturers to consider very carefully the use of both non-renewable raw materials and animal products.

Whilst no one, save for a few extremists, would consider leather anything other than a by-product of a vital food source, there are many consumers now questioning the ecological effects of the tanning process.

That is not to say that there are any hysterical outbursts that one would associate with the use many years ago of Sperm Whale Oil but more a question of what tanning effluents do to the immediate vicinity of the individual tanneries.

Tanneries in the so-called developed countries have been forced to tackle the problems of water and effluent treatment and indeed forced to absorb the costs of these measures. The problem is particularly severe for those tanneries in highly populated urban areas which have restraints of space on the installation of treatment equipment. The cost factor on some older tanneries with less modern manufacturing plant is also important as treatment systems can represent 10% of capital employed, and also on more modern units where it is estimated to be 5-71/2. Those that have not been able to adapt have either gone out of business or have been compelled to import all their Semi processed materials. Both the CLRI and the Indian Tannery Sector have made great strides to combat these problems but in the future the industry will have to be seen to

have done this and will have to promote the environmental component in its world wide marketing strategy.

The importance of the consumer power factor in the developed markets cannot be stressed enough, but the example of how 'green' pressures have all but destroyed the fur trade in Europe, simply by judicious use of the news media, vociferous protest and also, in extreme cases, the application of terror, such as fire bombing retail outlets concerned with fur sales is ample evidence of the strength of the factor.

All environmentally friendly processees cost a lot of money and the immediate past Indian Minister for the Environment has very forcibly stated at several international forums that the developed world should help India more with these huge costs. But the Indian leather industry will have to come to grips with the problem and devote time and effort to the promotion of their 'green' attitudes.

These costs will have to be borne by the industry and one can only hope that both the Indian Government and the International Community will recognise the importance of assistance to the sector.

There is also a very positive benefit in promoting environmentally sound products as an added marketing plus point. Many European and multinational organisations producing a whole range of products have found that, not only can this form of ecologically friendly promotion increase sales, but the product can quite often attract a premium on the eventual retail price.

4. Glasost

Although Glasnost is a Russian word, due to popularisation by the Western media it has come to represent the opening up of the formally closed or partially closed economies of Eastern Europe. The COMECON States now represent a new and exciting challenge to the marketeers within the Indian leather industry.

The reunification of Germany has certainly created new opportunities for Indian leather exporters, particularly those with established customers in the former FRG, because a lot of these customers have immediately looked to expand their production

base for finished products in footwear, garments and leathergoods, with previously moribund companies in the former GDR. The search for investment opportunities has been frenetic and this effort can only serve to develop the ailing and antiquated Eastern leather products sector. This, combined with the ability of the former Eastern manufacturers to now pay in D Marks, is a very positive plus point for Indian leather exporters.

With Poland, Czechoslovakia and Hungary actively working towards creating market economies and making huge efforts to develop their production facilities in the finished products sector, especially in footwear, the market opportunities are ever increasing. Must of this effort in these three countries is concentrated on attracting joint venture partners from the west and many of these investors will already be users of leather and uppers produced in India. How soon Romania, Bulgaria and Albania will be to follow this trend, and can be seriously considered potential hard currency customers, is difficult to judge but the signs are at least positive.

However, a negative component to perhaps the only encouraging aspect of this paper has to be noted; that is the very uncertain situation in the Soviet Union itself in which the nationalist movements in the Baltic States of Georgia, and even the Russian Republic itself could find themselves involved in yet another violent confrontation.

The world can only watch and wonder what the outcome of the disputes will be between the various Soviet Republics and Central Government in Moscow, but whatever the outcome, it would seem that the whole philosophy of Glasnost is under threat.

In conclusion of what must seem a very pessimistic view, the global political and economic outlook is difficult and very much in a state of flux in these times, with not too many optimistic indicators on the horizon.

There is strong evidence that even in countries like Germany and the US, economies are heading into recession. Whether the causes lie in huge trade deficits, high inflation, high interest rates or, in the case of Germany, the enormous costs of re-unification, this will all have an adverse effect on India's efforts to sustain and even develop its world market share for leather and leather products.

However, whatever recessionary developments beset world markets at the moment, the Indian leather sector seems to be doing a very positive job of ensuring its own important contribution to the economic and industrial development of India, and preserving its status as one of the worlds leading leather suppliers. It is clear that because of the strong committment to export and the industry's willingness to devote both time and funds to research and development of the very highest calibre, and with the technical expertise available in the CLRI there is at least some reason for optimism.

THE INDIAN LEATHER INDUSTRY IN THE CONTEXT OF THE CHANGING E.C. SCENARIO

R S CHAMBERS
COMMONWEALTH FUND FOR TECHNICAL COOPERATION, LONDON

The two fundamental aspects affecting E.C. attitudes towards the Indian leather industry are the outcome of the G.A.T.T. 'Uruguay Round' of trade negotiations and the forthcoming 'Single European Market' in 1992.

These two components can be classified as general attitudes, but we should also consider the individual relationships that the different E.C. member countries have with the Indian leather trade.

With regard to the G.A.T.T. trade negotiations, the E.C. stance on agricultural subsidies has caused major disagreement between member states on the one hand and the U.S.A., and other major food exporting countries, represented by the CHAIRNS Group on the other. Negotiations have been suspended and, until their successful resumption, the very real prospect of serious trade wars exists. This, of course would not just involve agricultural products but would affect derivatives including Indian leahter exports to the E.C.

If trade wars did develop, then the outlook for the Indian industry is hard to envisage. The problem would not be an unwillingness of European customers to purchase Indian leather, or governmental interference in that purchase, but more, "what would be the effect on the markets of the European leather product manufacturers?" Later in this paper when dealing with individual countries, some statistics are given on one component of the European leather sector, the footwear industry, which represents a major consumer of Indian leather.

The possibilities of a successful resumption and conclusion to the trade negotiations remain sanguine because the world must not fall into the insurmountable problems with a trade war would cause and it is felt that the E.C. negotiators will come to an agreement on agriculture with the other participants sooner rather than later.

The Single European Market, which is scheduled to be established in 1992, will create a common market between the member countries of approximately 300 million people. The deregulation of trade will affect all areas of goods and services, of which the customers of Indian leather will be included. By mnay, the single market is also seen as the precursor to political and monetary union leading to a Federal Europe. Whatever opinions are on this matter there is a very long way to go before this can be achieved, even if it is considered desirable in some quarters.

The trading block represented by the Single Market area is bound to affect buying and selling patterns of leather, and leather products and India must try to ensure that its leather producers are not adversely affected by these changes.

For example, in the case of footwear, as for other products, national quotas on imports, which some E.C. members have in place, will have to be eliminated; but they may be superceded by a Community quota of the "voluntary" export restrint or orderly marketing arrangement type.

As leather sales are only as good as the performance of the end-use products, it would be pertinent to examine each E.C. member country individually and attempt to forecase what will happen in 1992, based upon current activities in the sector.

The scenario in effect in the individual E.C. countries is considered viz-a-viz the Indian Leather Industry.

United Kingdom

As with all other E.C. countries the developments only in the leather footwear sector are explored here although of course, the garment, leathergoods and some areas of the furniture industry are very important to the Indian leather industry.

The U.K. footwear industry is ever more dependent on imported leather and leather uppers. This trend will continue whilst skilled workers in footwear manufacturing are in short supply, and the British economic climate forces tanners to further contract, which adversely affects their efforts to supply this sector. Upper supply is being sourced in Europe particularly in Portugal and Spain, but South East Asia, and Indiaa are becoming

increasingly important. There is, however, a major reluctance on the past of U.K. shoe producers from India. This reticence is based upon the historical problems of poor quality and indifferent delivery scheduling from Indian suppliers of both leather and leather uppers. The onus is on Indian suppliers to further develop and be seen to develop their reliability and quality control systems. This is already happening as a result of the success of some of the major Indian suppliers in several European countries. The trend must be to improve and promote energetically not only the technical capabilities, but more specifically the reliability, of Indian suppliers. Of course, CLE are aware of those problems, which are not confined to the U.K. market, and it is hoped that they will make every effort to further the great strides the Indian leather industry has made in technology and quality.

The U.K. consumption of all leather footwear has steadily increased to its current level of approximately 112 million pairs, and market forecasters are suggesting that this will increase by at least 10% per year from all sources. This type of footwear tends to be of the higher quality and price level, which even in times of recession, has historically shown regular annual growth. The same characteristic will apply to all the E.C. member countries.

Germany

With a consumption in excess of 260 million pairs of all leather footwear, and forecast to grow of at least 10% per year, the German market is vital to Indian suppliers of leather and uppers. The German shoe industry has shown itself to be very keen to source from India and it is understood that there are several plans underway by German shoe makers to establish even closer links, by way of technical assistance and investment, with several Indian tannery/shoe manufacturers. This trend has been caused by the ever increasing domestic costs of German shoe makers and by their determination and past success in their own quality control system in their source factories.

The German market is changing and will continue to develop as a result of reunification. The figures for consumption of 46 million pairs and for production of 44 million pairs for the former G.D.R. will alter significantly when the expected development of the Eastern industry is ongoing.

Here again there is much to be gained from aggressive promotion of the capabilities of the Indian leather sector.

Italy

Although Italy only has a domestic consumption of about 88 million pairs of all leather footwear it is one of the most important end users of Indian leather and uppers. This is because of its very large production base, which is currently running at about 390 million pairs. The very strong Italian tanning sector is suffering and is forecast to continue to suffer contraction and closure. This will create a large shortfall in upper materials for its domestic shoe industry.

The Italian footwear sector will no doubt continue to dominate the E.C. scene especially after 1992. The aforementioned forecast decline in tanning capacity will not be allowed to stifle the expansion of this sector. Here is a clear niche for Indian tanners to exploit these possibilities developing in the future.

Spain

In E.C. terms, Spain is becoming a major player in the sector and its importance to the Indian industry is ever increasing. With a production base of about 190 million pairs, growing by up to 15% annually, and a genuine shortfall of domestically produced leather, there are many opportunities for Indian leather exporters.

The Spanish footwear sector has traditionally looked inwardly when sourcing upper materials and uppers. It is now finding, and will continue to find, the constraints of a shrinking skilled labour pool, combined with increased demand for its leather footwear throughout the E.C. and worldwide, means that it has to increase its global search for supplies.

France

This country has traditionally had a high consumption of all leather footwear (now about 120 million pairs) and the indications are that in the foreseeable future it will continue to increase, particularly at the quality end of the market.

Domestic production of about 90 million pairs is also set to grow. As in the rest of the E.C. the tanning sector is under economic pressure and closures of tanneries are expected, which should once again open doors to imports, including from the Indian tanners.

Portugal

The footwear sector in Portugal is the fastest growing in the E.C., and whilst consumption of only 13 million pairs is not expected to grow, the production base of 56 million pairs is scheduled to at least double in the next 5 years. This exceptional growth will far outstrip the Portuguese tanning capabilities and the country will have to import far greater quantities of leather and uppers. Special effort should be made to promote India in this market, and extra effort made to court the other European footwear manufacturers who are establishing units in Portugal.

In the rest of the E.C. i.e. Belgium, Denmark, Holland, Greece, Ireland, Luxembourg and Netherlands the same contractions in domestic tanning and similar increases in consumption are apparent and these trends will continue and should be exploited by the Indian sector.

Country	Production	Import	Export	Consumption
U.K.	62.0	71.3	21.0	112.3
Belgium	2.7	24.9	3.2	24.4
Germany	65.5	238.8	43.4	260.9
France	90.6	56.8	27.0	120.4
Italy	391.0	8.6	312.0	87.6
Spain	187.0	0.7	94.0	93.7
Portugal	55.9	2.4	45.0	13.3
Denmark	1.1	8.9	3.3	6.7
Holland	6.3	32.5	8.6	30.2
Greece	9.6	3.9	6.1	7.4
Ireland	1.9	14.3	1.9	14.3
Luxembourg	No statistics			

Source: World Footwear Markets 1990

Published by:- Shoe and Allied Trades Research Association Information Centre (SATRA)

These statistics represent "all leather footwear" but excludes Safety footwear, Sports footwear and Slippers.

MAJOR GLOBAL CHANGES AND THEIR IMPACT ON INDIAN LEATHER INDUSTRY

K.SESHAGIRI RAO

CENTRAL LEATHER RESEARCH INSTITUTE, MADRAS 600 020

1.0 INTRODUCTION

The export of leathers and leather products valued at Rs.2030 crores accounting for 9% of the total export earnings of the country, hardly works out 3% in the total global imports, although in terms of basic raw materials India's share is 13.6% in bovine hides, 37% in goat skins and 6.6% in sheep skins. The Working Group on Leather Industry for 8th Five Year Plan fixed the export targets for 1994-95 to reach Rs.3500 crores mainly through enhancing the share of leather products from 65% to 78% while reducing the share of leathers from 35% to 22%. Taking into account recent spurt in the exports, coupled with the growth of production units within the country, the Commerce Ministry has suggested a target of Rs.10,000 crores to be achieved by the end of 8th Plan. Though the target seems to be fantastic but when expressed in terms of hard currencies (to eliminate the devaluation of rupee) and the level of our share in the global trade, it is not so. Whatever may be the targets, in terms of Indian currency, the aim must be to raise our share from 3% to at least to 15% by the end of the century. Apart from our preparedness to export, various global changes do play a decisive role in determining the export opportunities. Hence this paper takes stock of major global changes and discusses likely impact on the India's exports.

The important developments which are contributing for radical transformation in the International Trade scene comprise (i) already commenced process of integration of EEC into a single European Market by 1992, (ii) East European countries opting for market economy, (iii) emergence of United Germany that came into existence on October 3, 1990 and (iv) the newly industrialised countries - South Korea, Taiwan, Hong Kong and Singapore in South East Asia emerging as the important trade centres in Asian Region. The unforeseen Gulf crisis though shortlived, has left its adverse impact on the global trade and more particularly on the exports of developing countries.

2.0 Integration of EEC into a Single European Market by 1992

The proposed merger of 12 markets* of EEC with a monetary union into a single common market by 1992 is aimed at removing trade barriers and also at encouraging free flow of goods, services, labour and capital and harmonization of different laws and regulations within the community. With the integration into a single market, it is going to be the largest and powerful trading block. Although it accounts for 1.6% of world area and 6.5% of world population, yet it claims a share of 37% of world trade and one third of world's GDP. Further, it has set into motion a trend towards regionalisation of world trade and formation of economic blocks. A distinct possibility is also envisaged when EEC becoming a fortess of Europe by 1992 it may strengthen itself in the subsequent phases by embracing the present East European countries and possibly Soviet Union at a later stage. All these developments are bound to create serious consequences to the trade prospects of developing countries.

In 1989-90, 25% of India's exports and 33% of its imports were effected with EEC countries indicating the importance of this region to our trade. Between 1970-71 and 1988-89, India's exports increased from Rs.282 crores to Rs.4,946 crores and imports from Rs.320 crores to Rs.9,022 crores.

2.1 Implications of integration

* Perceptions on the implications of single European market widely differ.

* According to one school of thought, the European Community will become an economic giant and may likely to follow protectionistic and discriminatory trade policies detrimental to the export prospects of developing countries in the long run.

* Multinational corporations outside EEC may join together and start joint ventures with companies in EEC to have greater access into common market.

---

* U.K., Ireland, France, Germany, Netherlands, Belgium, Luxemburg,Italy, Denmark, Greece, Spain, Portugal

* To gain a stronghold in terms of production and market, some of the japanese firms already moved their capital, equipments and technology into EEC ahead of others.

2.2 Implication for Indian Leather Exports

Out of the total exports of leather and leather products (from India) valued at Rs.20,300 million in 1989-90, 49.6% were exported to EEC. In the total exports from India into the EEC, FRG claimed a share of 37%, UK 23%, Italy 18.3% and France 9.3% and these four countries together claimed 87.6%. Among the major items of export to EEC, finished leather accounted for 36%, leather garments 23%, footwear components 16% whereas leather footwear hardly accounted for 8% and the leather goods manufactures and sports goods of leather together claimed the balance share of 17%.

The Indian leather industry enjoying the low cost labour and rich raw material base will be in a position to avail the growing opportunities in the EEC and can step up its exports, provided the following measures are introduced:

i) The industry should modernise and undertake the production of high quality products in preference to low quality mass production items;
ii) The quality standards should be improved; and
iii) Strengthen the ability to undertake bulk orders by individual firms.

The package of export incentives has no doubt provided adequate boost but their continuation is viewed as counter productive by some. Under the incentive system, the real price of the product is not being realised in full and the benefits are fully or partly passed on to the importers. The Indian leather industry is very much sheltered and this has resulted in the neglect of quality improvement and competitiveness in the international market.

2.3 Likely Scenario

Taking into account various probabilities, the following situation most likely may engage in the long run.

(i) With further growth of employment accompanied by higher wages, the labour intensive and light industries like leather may go out of EEC region and in turn increased imports of consumer products having high wage content will be encouraged. The growing environmental regulations will accelerate the shift of the industries like tanning from EEC to third world countries.

(ii) Within EEC, there is however a possibility that countries like Spain, Portugal, Greece and Italy may try to expand their market shares in the first phase. If this happens, the size of EEC market to outside suppliers is likely to be affected. This phase of development will continue for short duration till their wage levels equalise with those of other member countries. But in the long run, the imports will have to come from low wage countries of Asia, Africa, Latin America. Another possibility may be that the technology and capital of EEC countries may move to East European countries that have recently opted for market economy. For setting up of footwear and leather garments units, they may take the advantages of labour force available. Part of EEC demand may be met from these ventures. But in the long run, the wage levels may go up in these countries and the end products may not be in a position to compete with those of third world countries in terms of price. The scope for expansion of tanning activity in the East European countries is very much limited in view of growing environmental regulations and treatment costs involved.

(iii) It may likely that Asian countries like South Korea and Taiwan with their strong production and marketing base stand to gain in a big way from the market opportunities that may loom large in the unified EEC. They have built-in flexibility with the imported technology to restructure their production systems in a short span of time and execute the bulk orders of high value added items. However, facing high wage demand, appreciation of currencies and problems of pollution, South Korea has shifted sizeable part of its production base to Indonesia, Thailand and Malaysia, whereas Taiwan shifted its production units to the mainland of China, Malaysia and Thailand. These developments indicate saturation in the expansion of the industry in their own countries.

2.4 Opportunities to India

* Indian leather industry continues to enjoy abundant raw material supply, low cost labour, the government support for promotion of exports and liberal imports of raw materials, machinery, accessories, etc. To claim a substntial market share in the unified market after 1992, the industry must be prepared to review its strategies and restructure its production systems just like European firms do to meet the needs of single market. Technological upgradation and aggresive market strategies seem to be imperative to meet the challenges.

* Under the existing incentive schemes, the real value of the products is not being realised and the incentive benefits are often passed on to the importers, defeating the spirit of incentives. The time has come to take a critical view of the export policies and take necessary measures that should accelerate the growth through higher unit realisation from the exports. It is not out of the context to mention that Korean leather industry does not enjoy today any more State support/intervention and it is entirely left to the individual industrialists to grow. State intervention is reduced to a minimum and as a result stands on its own strength and it has ventured out to set up production units in the low wage countries like Indonesia, Malaysia, Thailand and even China. This policy has promoted industrial efficiency as well as competitiveness within the domestic market and abroad.

2.4.1 Areas of Cooperation

* Setting up of processing plants in India in joint ventures between EEC and Indian partners for conversion of EEC hides and reexport in the form of upholstery and garments.

* Setting up of machinery manufacturing units for footwear, leather goods and leatherware, both for meeting domestic and external markets.

* Tie ups between Indian manufacturers and importing agencies in EEC for promoting the share of India's exports.

3.0 UNIFICATION OF GERMANY

The long cherished German unification took place on 3rd October 1990 and Duetche Mark was introduced as a legal tender in East Germany. It is strongly believed that the united Germany would emerge as the most important economic entity in Europe in the years to come. In course of time, its predominance will be visible at the global level too. Different predictions have been floated on its likely impact.

East Germany hopes that sooner than later, the blessings of West German prosperity will percolate down to the Eastern part whereas the West Germans do rejoice that their long cherished dream of one Germany materialised.

Both the productivity and salaries in East Germany have been reported prevailing at 1/3rd level of those in West Germany. The low level of productivity is attributed to frequent breakdowns of obsolete machinery, lack of raw materials, outdated technology.

The high technology and capital of West Germany is likely to move to Eastern part to tap the relatively low cost labour and to work for integrated socio-economic and trade prosperity of the united Germany; the acute labour shortages associated with high wage levels of West Germany would no longer remain a problem at least for some years to come.

But in the immediate future, it is feared that many uneconomic and technologically obsolete industrial establishments including tanning and footwear in Eastern part will have to be closed down contributing to the gorwth of unemployment.

The social benefits comprising cheap food supplies, subsidised transport, health care and educational facilities enjoyed all these years by the East Germans are bound to be withdrawn; the cost of living would rise on account of influence of West German economy. According to one forecast, under the changed circumstances, about 32% of East German firms can only survive, 52% currently working can pull through subsidies and credits and the balance 16% will have to face bankruptcy. In the short run, unemployment may rise from 0.1 million as it existed before unification to 2.0 to 3.0 million in the subsequent few years, after unification. The shoes, leather and textile industries are going to be affected seriously.

Most of the consumer products of East Germany suffer from quality inconsistency and lack of aesthetic appeal in terms of design and finish to the consumer.

3.1 Optimistic scenario

(i) Since West Germany committed to rehabilitate the shattered economy of Eastern part with a start up capital of 1 billion Deutche Mark, it can be visualized that the estimated magnitude of unemployment will be phased out with the setting up of many light industries like footwear with modern technology free from environmental pollution.

(ii) The suppressed unsatisted demand for consumer goods in the Eastern part is bound to get released with the inflow of the aid and consumer products. This has been amply demonstrated by the recent events. When the East Germans made heavy purchases of shoes and garments from West Germany in preference to their local products. West German made footwear models with high price tag have been found in great demand.

(iii) The wage differences between the West and East is bound to get equalised with the economic growth over the years.

3.2 Likely impact on Indian Leather Exports

(i) The rupee trade that was carried out over a number of years between India and East Germany has now ceased; in its place trade in hard currency with united Germany in Deutche Mark will take place, which will be beneficial to India. The trade in footwear uppers, with East Germany which claimed 9.6% of India's exports (1989-90), will be adversely affected with the closure of a good number of shoe closing units that employed 40,000 people located in erstwhile East Germany.

(ii) In other leather products too, bulk of the market in East Germany is likely to be lost.

The leather industry is far behind in terms of technology and productivity. If light industries like footwear, leather garments and leather goods are relocated, developed and promoted in the Eastern Region, it may likely that the inflow of imports from developing coutnries like India will be reduced. But if the envisaged economic boom at the rate of 8 to 10% per year flourishes in the united Germany, it would mean that the labour intensive industries cannot profitably be run and only continued imports from low cost labour countries would be logical. This scenario is broadly accepted. In that event, there would be no setback for the promotion of India's exports in terms of footwear, garments leather goods and even in leather Upholstery which has been relatively a neglected field. The wooden furniture with leather upholstery is another line of promise, in which at present India has no share in the West German Market. To carve out a bigger share in the German imports, definite way would be to push the share of high priced leather products in preference to low priced mass commodities.

There is now a growing awareness and interest among German entrepreneurs to invest in India and produce consumer products with buy-back arrangements. Footwear, leather garments, light machines required in leather and footwear industries seem to be some of the lines that can be considered for joint enterprises.

4.0 Eastern Europe

Glassnot and **Perestroika** have been sweeping throughout USSR and Eastern Rurope. With the reunification of Germany, the neighbouring East European countries have got bolstered to look to Western Europe for help in replacing inefficient politico and economic institutions. These are breathtaking developments. The major problems confronting their economics comprise slow or stagnant growth, declining productivity, energy intensive heavy machinery,massive environmental problems, foreign debts, deteriorating infrastructure etc. According to one estimate, the unemployment in Poland has exceeded 9% of the population, 15 to 20% in East Germany and yugoslavia, 5% or more in Bulgaria and HUngary. With this state of affair, it is uncertain, how long the bleak situation will last. The contrasting economic performance between East and Western Europes and the emergence of newly industrialised countries like South Korea, Taiwan make the East European countries to realise that efficiency and productivity lie in the market mechanism and as such they should opt for market economy. Various socio-economic reforms that are going ahead at a rapid pace have their significant

impact on the imports from developing countries. It is feared that the inflation is likely to raise once the subsidy component on consumer products is withdrawn in the socialistic block.

The COMECON trading system which has been in vogue is bound to be discontinued and in this place, the individual member countries have to necessarily export their goods to the world that compels them to boost their competitiveness of their commodities. For the revitalisation of their economies Western capital is considered indispensible. Hungary and Poland have been in the forefront in inviting Western investment for running joint ventures. To help the East European countries in their transition, a multinational banking institution has been set up by 24 industrially advanced countries. World Bank has brought out plans to provide aid to the extent of US $ 5 to 7 billions. The other Western industrialised countries are expected to provide massive aid. USSR alone is seeking an aid of US $ 24 billions from the West to partly get over the immediate scarcity of consumer goods and partly for restructuring its industries.

4.1 Likely impact on the exports of developing countries

The process of reforms in various Eastern European countries in favour of market economies may likely to lead greater economic integration and trade promotion with market economy countries in the West Europe and this development may reduce the export opportunities of the developing countries into Europe as a whole. Another view is that in the short term (between 5 years) that the production and export in Eastern Europe is unlikely to change and this may inhibit their export expansion in the Western markets. Further may not be able to meet the quality requirements of the West with the existing infrastructure in general.

In the medium term, ranging from 5 to 10 years, structural changes associated with the expansion of productive capacities are bound to take place and during that stage, they would be able to offer competition to the low and medium priced products manufactured in the developing countries. Once the trade and investment relations get strengthened and when the West European firms invest (with Eastern Europe) to produce and export back to their home countries, it may likely that the trade opportunities for developing countries will shrink in the integrated Europe (after 8 to 10 years).

In contrast to the above apprehensions, some visualise favourable export prospects as well as investment opportunities for developing countries since the kind of products required can only be supplied by them.

4.2 Likely impact on Indian exports

In 1988-89, USSR and COMECON countries together claimed a share of 21.6% in India's exports of leather and leather products. Footwear uppers, full shoes and finished leathers represented 13.2%, 0.6% and 7.1% respectively in the total country's exports; the composition and magnitude of exports are likely to undergo dramatic changes.

The rupee trade will cease to exist which is beneficial to India in the long run but in the immediate future these countries will not be in a position to pay in hard curencies and even they may seek exports on deferred payment basis to overcome their payment problem.

4.3 Declining tanning activity

Majority of the tanneries operate with pits with outdated machines and overstaff and they have become tremendous pollutors. The competition between them within their own countries is negligible and as such each tannery is lingering for its own survival. Similarly, the footwear factories do suffer due to lack of competitiveness, quality consciousness and inadequate fashion orientation.

In the short term, the status of leather industry does not seem to change for the better significantly and as such the exports from this region would be mainly in the hides and skins. At the same time, unsatiated demand for the imported goods has been suddenly released with the liberalisation of trade, but its impact may likely to be felt on the imports mainly from the supplies of Western countries. Among the developing countries, South Korea and Taiwan with their aggressive marketing system may stand to gain in a big way whereas India stands to gain to a lesser extent.

It is understood, USSR has invited Indian capital and technology to set up tanneries either exclusively or with tie-up with local participation. Although attempts have

been made to implement these proposals, but so far no tangible results have emanated. To encourage such ventures by Indian entrepreneurs both the Government and banks should come forward with necessary financial backing.

5.0 Newly Industrialised Countries (NICs)

In the post-war economic expansion newly industrialised countries of Asia, (otherwise known as four dragons of East Asia) viz. South Korea, Taiwan, Singapore, Hong Kong, have achieved remarkable industrial progress in recent years to prove even a small poor developing country can create an economic miracle when it makes full use of its comparative advantages in the world market.

5.1 Leather Industry - Major characteristics

1. These countries achieved remarkable progress in the field of leather industry and their exports based on the imports of basic raw materials mostly from developed countries.

2. In their total exports (the leather group) the combined share of footwear, garments and other leather products together ranges from 80 to 100% whereas for India it works out to 65%.

3. Most of their exports of finished products are directed to sophisticated markets. For example, South Korea absorbs annually 50% of exportable surplus of hides, skins and leathers of USA (that exports about 37 million hides and skins in total) and in return supplies to USA more than 50% of its exports in the form of footwear, travel goods of leather bags and leather garments.

4. The production and export of non-leather shoes like sports shoes is given equal importance along with full leather shoes to make them complimentary to each other in the export strategy. This complimentary in export trade is missing for India.

5. As a result of appreciation of curencies coupled with wage rise, production activity is increasingly getting shifted from South Korea and Taiwan to Indonesia,

1. Improvement of the existing processes and introduction of newer processes.
2. Improvement of the existing skills and tools.
3. Shortening the duration of processing, improvement of the quality and yield and realisation of added value.
4. Utilisation of local resources.
5. Reducing the fatigue and drudgery.
6. Realisation of the importance of science & technology.
7. Development of self-confidence.
8. Improvement of the economy by raising their working and living conditions.

SOCIO-ECONOMIC CONTRIBUTION

There is an overall improvement in standard of living conditions of rural tanners particularly with reference to nutrition, sanitation, health, clothing etc., in many areas with which the Institute has been associated. However, much improvement do not seem to have taken place in housing conditions, drinking water supply, reduced consumption of liquor etc. in certain places. The impact of extension work can be gauged by the following socio-economic benefits achieved in rural and small scale sectors.

1. It has created in this traditionally old industry an awareness of science and technology and their benefits.
2. Their income has gone up because of the added value by improvement in the quality and yield of the products they make.
3. A few of them have become successful entrepreneurs and have diversified their production.
4. There is a strong desire to make use of all the development schemes offered by the Government.
5. The literacy rate among the traditional leather workers has increased.
6. People from other castes have also taken up to this avocation because of more usage of leather and this has to a great extent reduced the 'stigma'attached to leather work.
7. Of late women in large numbers are being employed in various leather and leather products industries. A afew after undergoing training have become successful entrepreneurs. This has improved the socio-economic conditions and as a result, the whole family has been benefitted.
8. There has been an overall improvement in the socio-economic conditions of the workers.
9. They have developed self-confidence to a very great extent.
10. In Northern and Eastern regions, quite a number of raw hides and skins dealters have become tanners.

11. The leather and allied industry, in all sectors depend mainly for its labour force on the economically deprived classes of society and particularly in the last decade, the Institute could make its impact by raising the standard of living of small entrepreneurs in many places like Kolhapur,Jalandharand in certain pockets of Gujarat and Rajasthan.
12. The tanning community in general became affluent and concomitant results could be clearly seen to have reached the workers associated with the industry.

TRAINING PROGRAMMES

Apart from the various activities mentioned earlier, the Institute has started, of late, giving training programmes to women in making leather goods and puppetry. The training programmes are aimed at making them well equipped for getting employment in various leathergoods units/or for becoming entrepreneurs. Preference is given to the school drop-outs of rural areas belonging to Scheduled Castes or Schedules Tribe and also to destitutes.

To sum up, the Central Leather Research Institute has a major contribution in improving the socio-economic conditions of the rural artisans. Perhaps it is one of the very few organisations/institutions which cater to the needs of rural areas in such a big way. The growing demand for starting CLRI Extension Centres from different State Governments, itself is a testimony for the services rendered by the Institute, especially in rural areas.

MAIN ACTIVITIES OF EXTENSION AREA

1. Adaptive research and development in tanning and finishing as suited to the regional needs.

2. Practical demonstrations to tanners for making effective show-how of the know-how of the processes developed in the Institute.

3. Trouble shooting and solving adhoc problems posed by the industry.

4. Inplant development of the processes for new types of sophisticated leathers for export and tailoring the processes to individual buyers requirements.

5. Helping rural leather industry in improvement of processes.

6. Physical testing and chemical analysis to assist the industry in effective quality control and standardisation.

7. Survey of leather and allied industry in various States/Regions of the country.

8. Preparation of feasibility studies, project reports, layouts, plans etc. for setting up new tanning units or diversificatioin of existing units as may be required on specific request.

9. Technical consultancy and trade councelling.

10. Acting as eyes and ears of the Institute to bring feedback information and tanners' problems for the formulation of research programme of the Institute.

11. Maintaining effective liaison between the industry and the Institute.

PLACES OF EXTENSION CENTRES AND STATES & REGIONS COVERED

Extension Centres		States & Regions covered
1.	Calcutta	West Bengal, Assam,- Bihar, Orissa, North Eastern States, Sikkim.
2.	Kanpur	Uttar Pradesh, part of Madhya Pradesh.
3.	Jalandhar	Punjab, Haryana, Himachal Pradesh, Jammu & Kashmir Union Territories of Delhi and Chandigarh.
4.	Rajkot	Gujarat and Rajasthan
5.	Bombay	Maharashtra, part of Madhya Pradesh
6.	Base Unit	Andhra Pradesh, Karnataka Kerala and Tamilnadu.

ACTIVITIES DONE IN RURAL SECTORS

1. Practical demonstrations of improved processes in tanning, curing and preservation of hides, utilisation of by products in the very doors of rural tanners.

2. Training cum demonstration camps.

3. Collaboration with rural development organisations/ Trusts/Agencies/Foundations/KVIB & KVIC/SISI for rural development of leather industry.

4. Integrated rural development work for leather and leather goods in collaboration with organisations like Institute of Management, Social Works & Research Centre, Design Centres, Banks, etc.

5. Seminars and Workshops

6. Training of artisans in machine operations and leather processing.

7. Schemes and layouts (comprehensive schemes like living quarters, tanning sheds, common facility centres) for rehabilitation of rural tanners in certain states.

8. Conducting studies on the status of rural leather and allied industry and providing suggestions for improvement on the basis of various techno-economic surveys carried out in many states/regions by our Institute on leather and allied industry.

9. Trade counselling and technical enquiry.

10. Bringing out leather journals in local languages like Hindi, Urudu, Gujarathi, Marati, Tamil describing the processes.

11. Inviting few rural tanners from various regions annually to the Institute during our Leather Week so as to get them exposed to the importance of science and technology.

12. Priority and free service for rural leather and allied industry whenever the Institute is approached

EVALUATION OF EFFECTIVENESS OF TRANSFER OF TECHNOLOGY IN RURAL SECTOR

The technology disseminated in the rural sector has

- improved the existing process
- improved the skills
- improved the tools
- cut short the duration of the processing time
- improved the quality and yield
- introduced newer methods
- utilised the local resources
- minimised to some extent the fatique and avoided drudgery
- made the rural tanners to develop certain amount of self-confidence
- made them to get added value
- made them to realise the importance of science and technology
- improved the economy by raising their working and living condition

SOME OF THE PLACES WHERE DEMONSTRATIONS WERE CONDUCTED

SRINAGAR	Kanpur	Sonagarh
Jammu	Banaras	Jaisinghpurakher
Kathua	Lucknow	Jalwar Patan
Ananthanag	Mehesana	Palampur
Amritsar	Sundarnagar	Godhra
Jalandhar	Nawagarh	Jamnagar
Kotkapura	Chalisgaon	Gorakhpur
Banga	Barabanki	Bakshi Ki Talab
Malerkotla	Sujangarh	Patna
Kapurthala	Banswara	Darbhanga
Patiala	Malcot	Bihta
Ambala	Sargaon	Bettiah
Ludhiana	Kobra	Sakri
Delhi	Kotra	Batnagar
Sonepat	Jawaja	Calcutta
Meerut	Luniapura	Gauhati
Chamba	Toda Raisingh	Sikkim
Agra	Harnara	Manipur

Cuttack	Bhopal	Chorwad
Titlagarh	Jabalpur	Baroda
Bhagalpur	Miraj	Ahmedabad
Muzaffarpur	Dhond	Surat
Monghyr	Chittaldurg	Idar
Sagarpur	Husanabad	Saganeer
Sitamarhi	Choppadandi	Pokhran
Bihar Sharif	Belgaum	Kankroli
Champaran	Gaya	Rajsamund
Bijapur	Ranchi	Erinpura Road
Una	Gomla	Sandhari
Varjangjalia	Baudh	Kishegadha
Bhir	Rewari	Pokhran
Bombay	Jodhpur	Babaicha
Poona	Jaipur	Baran
Satara	Bikaner	Gillond
Sholapur	Barmer	Amarvathi
Kolhapur	Bassi	Neemuch
Goa	Sanganer	Nursingarh
Nagpur	Tonk	Vidhisha
Wardha	Udaipur	Dewas
Indore	Rajkot	Saugar

SESSION III

Alternate Technologies and Techniques for Leather Industry

ENZYMATIC UNHAIRING

K S JAYARAMAN *
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

INTRODUCTION

Biotechnology,which is making rapid developments has found its usefulness in the field of leather processing in some of the unit operations. Relative importance of the enzymes and its application to leather processing technology could be realized by the fact that it formed the subject of Arthur Wilson Memorial Lectures in 1988 at the American Leather Chemists' Association (ALCA) meeting. Application of enzymes is becoming increasingly important due to progressively stricter control by authorities in treatment of effluents and consequently for developing cleaner process technology in leather manufacture. A look at a different stages of leather processing clearly indicates that maximum load of effluents (both by way of volume and toxicity) arises in beamhouse operations - soaking, liming, deliming and pickling. While the total quantity of water used is between 30 and 35 litres per kg of raw stock when processed from raw to finish, the quantity of water upto tanning alone is about 20 litres per kg of raw stock. Hence, the need to look into the problem of effluents and toxicity at this stage is of primary importance.

The application of enzymes had been known in the tanning industry for a very long time. In the process of bating, alkaline bates as well as acid bates are finding increasing use. The use of enzymes in soaking particularly,dry raw stock, has also been advocated and a few proprietary products are also available in the market. In India, the use of Aak milk and Jawasi leaves by fermentation process have been adopted for removing the hair in rural tanneries, but they have not been commercially exploited due to various practical difficulties. (The most common way of removing the hair and unwanted material in the leather processing is carried out in the liming process which essentially consists of using lime along with sharpening agents like sodium sulphide. The extent of sodium sulphide used varies between 2 and 4% on soaked weight of the skins. This method of liming is carried out in paddle/drum/pit. Most of the tanners have adopted this method in place of the conventional method of using three pit system of liming in which no sulphide is used. Because of the relative advantage of accelerating system of unhairing,using sodium sulphide, the modern system of liming has come to stay. The objective of liming is multifold:

---

* Since superannuated

(i) to remove hair;
(ii) to open up the fibre bundles to the desired extent;
(iii) to swell the adipose tissues to enable the removal of unwanted flesh; and
(iv) to Saponify the skin lipids.

Sodium sulphide is the main pollutant in the liming system and during this system of liming, the problems are:

(i) the formation of sludge due to partially dissolved hair;
(ii) Protein due to solubilised keratin;
(iii) Sodium sulphide producing an unpleasant odour and sometimes liberation of hydrogen sulphide and causing air pollution and toxicity, and,
(iv) High level of BOD in the effluent.

The above factors contribute to difficulties in the treatment of effluent as well as increased cost in reducing the level of BOD to an acceptable level which ultimately leads to higher cost of production. Hence, the new system of liming has to be examined in this context as to what extent it can be minimised or eliminated without sacrificing any of the objectives that had been mentioned before.

Enzymes assisted process which reduces the use of sodium sulphide to an extent of 40% had been practised and products have been put in the market. However, these processes do not completely dispense with the use of sodium sulphide. There are also products which can be used alone for the removal of the hair but they are not cost effective. In the application of these enzymes, the favourable factors that had been reported are apart from cleaner environment, reduction of the growth mark, clearer grain, smoother grain surface and improved strength. However, these enzymes have specificity with respect to pH and temperature and most of them have collagenase activity and commercially not viable. Hence, there has been a necessity to find out a suitable commercially adoptable type of enzymes for practical translation.

Development of cost effective enzymatic unhairing agent at CLRI:

CLRI has been working on this particular aspect of unhairing enzyme for the past couple of years on the development of a cost effective method of production of an enzyme depilant of microbial origin. A new strain of Aspergillus flavus has been isolated which can produce large amounts of extra cellular protease. It is widely recognised that solid substrate fermentation has distinct economic advantages over submerged fermentation wherever it is feasible to apply this system. It has also been found that this particular species is non-toxicogenic. The properties of this enzyme have been

characterised and it has been found to be active over a broad pH range of 6 to 10 and the activity also ranges over a temperature of 25°C to 50°C with an optimum at 45°C. The activity profile thus indicates that in a tropical country like ours it could be employed throughout the year, even though in upper India the conditions may have to be worked in the winter when the temperature goes down. It has been found that it has very little activity on collagen, elastin or keratin, so that during the application of the enzyme it is expected that the solubilisation of collagen may not take place and the hair will come out without loosing its strength.

Evaluation and Practical Application

This enzyme was first evaluated in CLRI Pilot Tannery on goat and sheep skins and subsequently field tested in the tanneries. Each of the tannery was following a differnt method of liming and there was a need to introduce the enzymatic unhairing system to fit into their line of production. All of them were producing vegetable tanned leathers. Hence, while carrying out the trials which were done in a batch of 200 skins, after initial enzymatic unhairing, subsequent liming was done either in pit/paddle. In all cases a reliming with an old lime liquor was necessary to remove the remnants of hair which were present near the edges and the neck region and subsequently reliming was done to plump up the skins to enable the fleshing. After fleshing, the pelt weight was recorded and the experimental lot was mixed with the conventional limed lots in the tannery and all the skins were processed in a similar way. The leather yield and other characteristics were assessed and compared. The vegetable tanned leathers were subsequently semichromed and converted into semichrome upper leathers and graded. The salient features of the process and the results obtained are reported.

Thus, it could be seen from the results, that the pelt yield and leather yield are the same in the enzymatic unhaired pelt after suitable reliming operations. In two tanneries there was saving in time of processing and sodium sulphide was completely eliminated in all the tanneries.

Regarding the characteristics of the leathers produced, they were comparable in mellowness and feel to those of the control. Strength was better in enzyme treated leather.

Some of the characteristics that had been observed in the enzyme treated pelt compared with lime sulphide process are tabulated below:

The relative advantages over the conventional lime sulphide system adopted in the different aspects, particularly from the abatement of pollution in beam house and improving the quality of hair have been clearly brought out from the assessment in Table II.

When the pelts were processed into vegetable tanned leather and compared to conventional process it has been found that the leathers through enzyme process had smoother grain with improved strength and compared favourably in other properties. However, they tended to be firmer.

The application of these studies were extended to buff calf skins and cattle hides. However, in these cases, there was difficulty in diffusion of the enzyme by the existing system of painting on flesh side although green fleshing improved the penetration to some extent. Since fleshing may not be practically feasible, more modifications are needed such as high pressure techniques by which the liquid could be forced through more effectively to affect the grain membrane. However, recently these enzymes have been tried giving a large float in pits for longer time (48 hours) and quite encouraging results are obtained, the limiting factor being the amountof enzyme employed should be high (4-5% which may become costlier.

CONCLUSIONS

The new cost effective enzymatic unhairing agent developed at CLRI has been commercially evaluated in three different tanneries who are processing goat skins and leather produced have been found to be satisfactory and comparable to control. These vegetable tanned leathers have been further semichromed and compared to conventional semi chrome leathers and reported to be satisfactory. The application of enzymes in beamhouse in eliminating the pollution load due to sodium sulphide, in the processing of skins is, thus a practical, commercial possibility.

Results

Tannery I

Existing Process	New Process based on enzyme	Remarks
- Pit liming 7 days Lime + 1% Na_2S Unhair - Relime in pits Total duration 11 days Pelt yield 80% Leather yield 34%	Paint liming with enzyme composition [enzyme 2% [Kaolin 7% [Wetting agent 0.2% [Preservative 0.2%-24 hrs [Water 10% Unhair Dip in lime-Pile 1 day Relime Old lime liquor (pit) 2 days Fresh lime liquor 2 days in paddle Total 6 days Pelt yield 80% Leather yield 33%	Saving in time t days. Sod. sulphide eliminated.
Tannery II : - Pit liming - old lime liquor - 5 days - Fresh lime liquor +1% Na_2S5 days Total 10 days Pelt yield 80% Leather yield 34%	As in Tannery I Pelt yield 80% Leather yield 33-34%	Saving in time 4 days. Sodium sulphide eliminated.
Tannery III : - in pits-fresh lime + 1.5% Na_2S 4 days - Paddle-fresh lime + 0.5% Na_2S 1 day Total 5 days Pelt yield 80% Leather yield 33%	Enzyme unhairing 1 day Piling after dipping in lime 1 day - Pit liming in old time liquor 2 days - Paddle liming with addition of soda ash 1 day Total 5 days Pelt yield 80% Leather yield 33-34%	No saving in time Na_2S eliminated.

Table II

Characteristics	Enzyme Process	Lime sulphide process
1. Pollution hazard	Minimum	Pollution due to sodium sulphide
2. Nature of hair loosening	Hair gets removed along with epidermal layer	Hair roots are cut of due to the chemical reduction process.
3. Strains	No stains	Gree/blue stains due to sulphide
4. Quality of wool	More lengthy, stronger, requires minimum washing afterwards	Lower length, contaminated, with sulphide and requires drastic washing. Sometimes hairs gets pulped.
5. Odour	No odour during unhairing	Odour due to sulphide
6. Scope for assessment	Easier on the pelts and clearer gain.	Assessment difficulties due to sulphide stains.

COMPUTER CONTROLS FOR TANNERY WET OPERATIONS-PART I

C Muralidharan, H Purushotham, KS Jayaraman and KV Raghavan
Central Leather Research Institute, Madras
and
G Prasad and PE Sankaranarayanan
Central Electronics Engineering Research Institute
Madras

This paper is presented in two parts. Part I deals with the application of computer controls for tannery wet operations and Part II deals with the computer hardware and software development for the tannery wet operations.

Under the aegis of an Integrated Mission Programme of Eighth Plan on the "Modernization of Indian Leather Industry", extensive scientific investigations are being undertaken at CLRI to develop knowhow and design engineering packages for commercial exploitation. This programme received significant boost in the year 1990 when the first large Indian tannery commissioned micro-processor control systems for its wet operations. This paper presents the recent efforts of Central Leather Research Institute (CLRI) in association with Central Electronics Engineering Research Institute (CEERI), Pilani in developing the simple computer assisted control systems for application in small scale tanneries. The entire hardware and software are based on Indian manufactured equipments, instruments, computers and auxiliary facilities. The technical objectives of the programme are as under:

1. Upgradation and quality control of the finished leather by minimising batch to batch variation through effective inplant process control measures.
2. Optimisation and rationalisation of material and energy consumption.
3. Reduction of effluent loads in waste streams as a consequence.
4. Development of indigeneous computer assisted control systems for application in small scale tanneries.
5. Modular design for cost effectiveness.

To meet the above objectives, an integrated demonstration plant is set up at CLRI pilot tannery. The major operations investigated for process control are:

- chemical preparation and dosing
- hot water generation and addition

- float pH and drum operation control
- data logging

Table 1 lists the various unit processes brought under the purview of Computer Assisted Processing (CAP) in the demonstration plant.

Table 1

COMPUTER CONTROL OF TANNING PROCESS

Pre tanning Operations	Post tanning Operations
- Deliming & Bating	- Rechroming
- Pickling	- Neutralisation
- Chrome Tanning	- Retanning, Dyeing & Fatliquoring

TECHNICAL DESCRIPTION

Computer assisted chemical addition system (CACAS)

i.	Type	Chemical mixing tank equipped with electronically controlled Load cell
ii.	Automatic dosable bulk chemicals	Each module can handle 8 drums upto 10
iii.	Manually addable products	Any number
iv.	Mixing tank charge volume	500 litres

v. Accuracy of weighing + 200 gms
vi. Automatic drawing in of chemicals from bulk storage tanks
vii. Automatic charging into the pre-selected drum/intermediate chemical storagte tank
viii. Automatic purging of the chemicals in the line
ix. Data logging and printing of chemicals charged

Fig.1 shows the schematic diagram of CACAS.

Computer assisted water addition system (CAWAS)

i.	Type	Steam injection water heater-cum-mixer
ii.	Drum handling capacity	6-8 drums
iii.	Operating pressure	2 atm
iv.	Water flow rate	Any rate depending on the requirement
v.	Temperature of hot water	50 - 60°C
vi.	Temperature accuracy	± 2°C (mixed hot water)

vii. Mixing of steam and cold water streams to achieve desired mixed water temperature; instant hot water supply
viii. Addition of controlled quantity of mixed water to the pre-selected drum
ix. Data logging and printing of water additions

Fig.2 shows the schematic diagram of the CAWAS.

Computer assisted pH monitoring and drum control

i. Controlled addition of critical chemicals under close scrutiny of pH controller
ii. Automatic indication of end point of pH
iii. Provision for sampling the float
iv Better solid-liquid contact through the controlling of drum rotation and its direction

An existing drum in the pilot tannery is partially modified by introducing a separate compartment for housing the Process Liquor Sampler (PLS). It collects the process liquor and sends to the pH transmitter through a closed circuit pipe loop which enters and leaves the drum through the axis. **Fig. 3** shows the broad details of the arrangement. A pH indicator - transmitter continuously monitors the hydrogen ion concentration of the process liquor during the various process operations. The process liquor is continuously circulated in the pipe loop.

Integrated pilot facilities for process investigations

Fig. 4 shows the process engineering flow scheme of the pilot facilities for a twin drum system consisting of computer assisted chemical and water additions, pH control and drum rotation control. **Fig. 5** highlights the link up of computer system to the process control units through the interfacing devices. **Fig. 6** presents the isometric view of the control units attached to one of the drums. The pilot facility can be used for the process investigations pertaining to deliming, pickling, chrome tanning, neutralization, dyeing, fat liquoring and other wet operations.

Pilot Investigations: A series of pilot scale runs are carried out to assess the time savings, system reliability, chemical uptake, operational flexibility, product quality upgradation and consistency in product quality. Following operations have been selected for the pilot studies:

i. Deliming
ii. Pickling
iii. Basification in Chrome tanning and Rechroming
iv. Neutralization
v. Retanning
vi. Fatliquoring
vii. Dyeing

The first task in the pilot investigations is to allocate chemical and intermediate storage tanks for various chemical addition operations. A typical allocation schedule is shown in **Table 2** for the unit operations and processes selected for the present investigations.

Table 2 : Allocation of storage tanks for controlled addition of chemicals

Operation	Chemical stored	Pre-tanning	Post tanning	Remarks
Deliming	Ammonium Chloride	AST-1		Regulated addition
Pickling	Sulphuric acid Formic acod	AST-2		"
Basification	Sod. Formate & Sod. Bicarb	AST-3	AST-1	"
Neutralization	Sod. Bicarb		AST-2	"
Fatliquoring	Fatliquors		CST1+CST2	
Dyeing	Dye		IST1 & 2	
Dye fixing	Formic Acid		CST3	

Following precautions have to be taken for smooth functioning of control valves and instrumentation.

i. Filtration of all liquids to remove solid particles
ii. Cleaning and flushing of pipelines after chemical charging is completed
iii. Periodic cleaning of PLS to remove solid suspensions deposited on the wire mesh

Preparation of process recipe and communication to the computer system

All operations including once through solid and liquid chargings, regulated chemical and water additions, drumming, process liquor draining and hide/skin loading/unloading have to be properly sequenced for each unit process and documented. The quantities of chemicals and water charged in the drum are to be recorded. **Table 3** shows a typical process recipe for three unit processes selected for the pilot investigations. This forms the input information for the computer system.

Table 3 : Recipe of Post-tanning Operations (A Computer Control Approach)

Rechroming phase	Neutralization	Retan - Dye - Fatliquor
* Charge skins addition of water * Addition of acetic acid Drumming and preparation of alkali solution * Drain float * Addition of water * Addition of chrome syntan * Drumming * Drumming and addition of alkali solution * Drain float and discharge skins	* Charge skins * Addition of water Drumming and preparation of alkali solution * Drain float * Addition of water * Addition of alkali solution * Drain float * Addition of water * Drumming, preparation of Fatliquor * Drain float	* Addition of water * Addition of Fatliquor * Drumming, preparation of dye solution * Drumming * Addition of Syntan * Drumming, preparation of Fatliquor * Drumming and additoin of Formic acid * Drain float, discharge skins * Rinsing * Piling

* Manual operations

Computer assisted processing (CAP)

The charging of chemicals is completed as per the allocation schedule and all the operations as sequenced in process recipe are undergone with the assistance of computer. Whichever operations requiring manual intervention are identified at appropriate periods and executed as per the local digital indication at the appropriate unit. The typical operations needing manual intervention are

i. Opening and closing of drum doors
ii. Charging and discharging of skins
iii. pH testing of leather samples for online countercheck of quality
iv. Draining of float liquor

Results and Discussion

All computer assisted operations are compared with conventional manual operations by employing same quantities of chemicals, skin/float ratio, duration for mixing and reaction and rpm of drum. Same drum is used for both computer assisted operations and conventional manual operations to maintain same hydrodynamic conditions. In order to monitor precisely the efficiency of the computer assisted system, the raw material is cut into two halves and one half processed in the computer assisted drum and other half in the manually operated drum. The strategies adopted for pilot investigations are given in **Figs. 7 & 8**. The resultant leathers are analysed for chemical uptake both layerwise and over different areas in the skin as shown in **Fig. 9**.

Deliming: As a departure from conventional practice, the acid salt is continuously added to the drum in regulated quantities with a close monitoring of float pH level. The pH profile of conventional and computer assisted deliming is shown in **Fig. 10**. The positive aspect of this operation mode is evident from the more uniform distribution of chemicals in grain, middle and flesh layers and on the entire area of the hide/skin achieved during subsequent operations. **(Table 9 and 10)**. Nearly 50% of the chemical consumption is also reduced in the computer assisted operation.

Pickling: Continuous and regulated addition of acid with close monitoring of float pH is found to be beneficial in terms of uniformity in layer wise uptake and distribution of chromium during subsequent tanning **(Table 9)**. The chromium distribution over the entire area of the skin is also found to be more uniform **(Table 10)**. The pH profile during computer assisted pickling operation is shown in **Fig. 11** along with that obtained from the conventional mode of acid addition.

Basification: Literature evidence shows that slow basification promotes uniform chrome fixation. Computer assisted basification operation is found to prove this aspect. The wet blue leathers made with computer assisted processing on assessment were found to be fuller, softer, squarer with smooth grain compared with those conventionally basified. The pH profile of basification during chrome tanning and rechroming are shown in **Figs. 12 & 13**.

Apart from uniform spacial distribution of chromium **(Tables 9 & 10)**, its uptake is found to show upward trend in computer assisted operation. This has a positive influence on the subsequent operations viz., neutralization, retanning, dyeing and fatliquoring. Savings in processing time is another advantage of the computer assisted operation.

Neutralization: pH profile as obtained from computer assisted neutralization and conventional system is shown in **Fig. 14.** The leathers are found to be neutralized to a greater extent and more uniformly as compared to the conventional processing **(Table 9 & 10).** It is well-known that uniform neutralization promotes fatliquor uptake and its distribution in the leather. This is shown in **Table 5.**

Table 5 : Layerwise distribution of oils and fats (Sampling position - SLTC)

Layer	% Oils and Fats	
	Neutralization using computer	Conventional Neutralization
Grain	15.81	11.56
Middle	15.96	12.21
Flesh	16.00	13.00

Retanning, dyeing and fatliquoring

Computer assisted operations are found to favour reduction in the input of chromium and fatliquor in view of their higher uptake. The enhanced uptake of dye during computer assisted operation is shown in **Table 6.**

Table 6 : Uptake of Dyes

	Sampling Position					
	1		2		3	
	CAP	CON	CAP	CON	CAP	CON
L	45.0	44.0	44.7	43.5	45.2	44.2
a	14.5	11.7	14.5	12.4	14.3	12.2
b	20.8	18.0	20.0	19.1	20.4	19.3

L - Lightness/darkness
a - Redness/grennness
b - Yellowness/blueness

Dye used - Naphthalene Orange

Inference: A better dye uptake results when dyeing was carried out using computer controls

Overall benefits of computer assisted operations in leather processing

Overall benefits that accrue on implementing computer assisted operations are far reaching from techno economic considerations. The results of the pilot investigations as reported in this paper decisively proves this aspect. The notable amongst the technical benefits are highlighted below.

1. Savings in process time: Considerable reduction in process time could be achieved mainly due to quicker addition of chemicals and water and insite monitoring of product quality. **Table 7** provides the details.

Table 7 : Savings in Process Time
(Based on attainment of equilibrium)

Unit Process	Time (Minutes)		% Savings
	CAP	Conventional	
Deliming	30	60	50
Pickling	40	70	43
Chrome Tanning	105	135	22
Rechroming	105	135	22
Neutralizing	40	70	43
Total	320	470	32

2. Enhanced chemical uptake: Chemical uptake has improved at various stages of processing. This can be clearly seen from **Table 8** showing the chemical characteristics of the crust leathers obtained by controlling all the operations through the computer (cumulative effect). The spacial distribution of chemicals has also shown very significant improvement.

3. Uniform chrome distribution in leathers: Strati-graphic and spacial distribution of chromium in leathers has shown significant improvement during computer assisted processing. The relevant data is presented in **Tables 9 & 10.** The leathers are accordingly found to be fuller and softer with smoother grain.

4. Overall improvement in leather quality and consistency: In view of its economic importance and subjective nature of leather assessment, the leathers obtained from the pilot investigations have been assessed by two professionally competent tanners. Batch to batch variation in leather quality has been considerably reduced in computer assisted processing. A significant upgradation in quality is observed in same grades of leathers. **Table 11** shows the results. One of the significant achievements is the notable reduction in the quantity of rejects and lower grade leathers.

5. Lesser load of pollutants in effluent streams: Due to the increased uptake of chemicals during leather processing, the overall pollutant load in the effluent streams is found to be on the downward trend. This is a significant development for environmental point of view.

Conclusion

The advantages of individual computer assisted operations like chemical and water additions, drum revolution control and pH control have been well reported in literature. The present work demonstrates the combined impact of these operations on the process efficiency and leather quality. The impressive results obtained from the regulated addition of critical chemicals with simultaneous monitoring of pH shows the need to integrate this operation with others to get maximum benefit. CLRI has developed the necessary hardware and software packages for implementation in small scale tanneries. The techno economics are attractive enough for the tanners to avail the new opportunity available for modernization of their tanneries with minimum financial resources.

Acknowledgements

The authors are grateful to Dr G Thyagarajan, Director, CLRI for his inspiring guidance and encouragement. The authors are thankful to Shri S Ananthanarayanan and Shri V Haridoss for their technical assistance. The authors wish to thank Ms S Poorneswari for carrying out analytical tests. The authors also wish to place on record the contributions made by S/Shri MR Sridharan, K Sesha Sai, S Srikanth, T Gurunathan, R Venkatachalapathy, KR Radhakrishnan, Ms Lalitha Chellappa and Ms V Rajyalakshmi.

Table 8 : CHEMICAL CHARACTERISTICS OF CRUST LEATHERS
(Cumulative effect of all the computer controlled operations)

Characteristics	Neck		SLTC		Butt		Forelimb		Belly	
	CAP	CON	CAP	CON	CAP	CON	CAP	CON	CAP	CON
1. % Oils and fats	15.53	12.90	15.79	12.21	15.51	12.29	15.09	11.92	15.01	11.73
2. % Hide substance	64.27	63.45	64.41	63.35	62.77	62.83	64.04	64.00	63.14	63.05
3. % Fixed organic matter	13.98	16.79	13.96	16.68	14.58	17.89	14.05	17.07	14.07	18.20
4. % Cr_2O_3	5.34	4.86	5.35	4.81	5.31	4.93	5.36	4.99	5.30	5.20
5. pH of water solubles	5.14	4.36	5.06	4.06	5.01	4.23	5.01	4.91	5.16	4.83

Characteristics 1 to 4 are calculated on 0% moisture basis

CAP - Computer Assisted Process
CON - Conventional Manual Process

Table 9 : STRATIGRAPHIC DISTRIBUTION OF CHROMIUM

Layers	Uptake of Cr_2O_3 (%) as influenced by								pH of water solubles on Neutralization	
	Deliming		Pickling		Tanning		Rechroming			
	CAP	CON	CAP	CON	CAP	CON	CAP	CON	CAP	CON
Grain	3.49	3.63	3.92	3.46	3.58	3.33	7.16	6.01	5.94	5.43
Middle	3.33	3.43	3.79	3.26	3.53	3.25	7.14	5.77	5.91	5.66
Flesh	3.36	3.30	3.81	3.06	3.53	3.29	7.33	6.15	5.93	5.80

(percentages expressed on moisture free basis)

Sampling position : SLTC

CAP - Computer Assisted Process
CON - Conventional Manual Process

Table 10 : DISTRIBUTION OF CHROMIUM OVER THE AREA OF THE SKIN

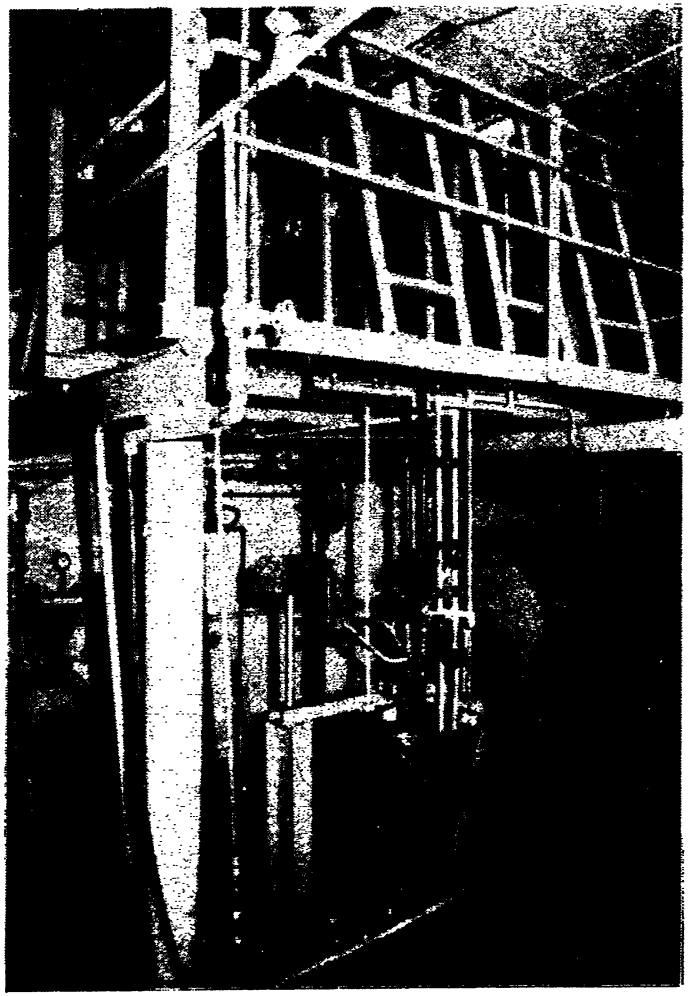
Sampling position	Uptake of Cr_2O_3 (%(as influenced by								Neutralisation pH of water solubles	
	Deliming		Pickling		Tanning		Rechroming			
	CAP	CON	CAP	CON	CAP	CON	CAP	CON	CAP	CON
1	3.3	3.68	3.78	3.20	3.50	3.26	7.03	5.43	5.86	5.71
2	3.26	3.24	3.84	3.26	3.48	3.29	7.16	5.22	5.86	5.65
3	3.20	3.28	3.87	3.23	3.44	3.10	7.30	5.86	5.88	5.75
4	3.21	3.24	3.86	3.30	3.42	3.08	7.35	6.10	5.90	5.82
5	3.39	3.36	3.90	3.45	3.54	3.39	7.13	5.86	5.83	5.64
6	3.31	3.30	3.79	3.41	3.46	3.22	7.21	5.98	5.86	5.73

CAP : Computer Assisted Process
CON : Conventional Manual Process

Table 11 : QUALITY ASSESSMENT OF CRUST LEATHER BY TANNERS

GRADE	EXPERT OPINION A : TANNER CAP (%)	EXPERT OPINION A : TANNER CON (%)	EXPERT OPINION B : TANNER CAP (%)	EXPERT OPINION B : TANNER CON (%)	AVERAGE RESULTS CAP (%)	AVERAGE RESULTS CON (%)
I and II	5Ø	25	63	43	35	15
III	31	38	25	25	28	31
REJECTS & LOWER GRADES	19	37	12	32	16	35

CAP - Computer Assisted Process
CON - Conventional Manual Process



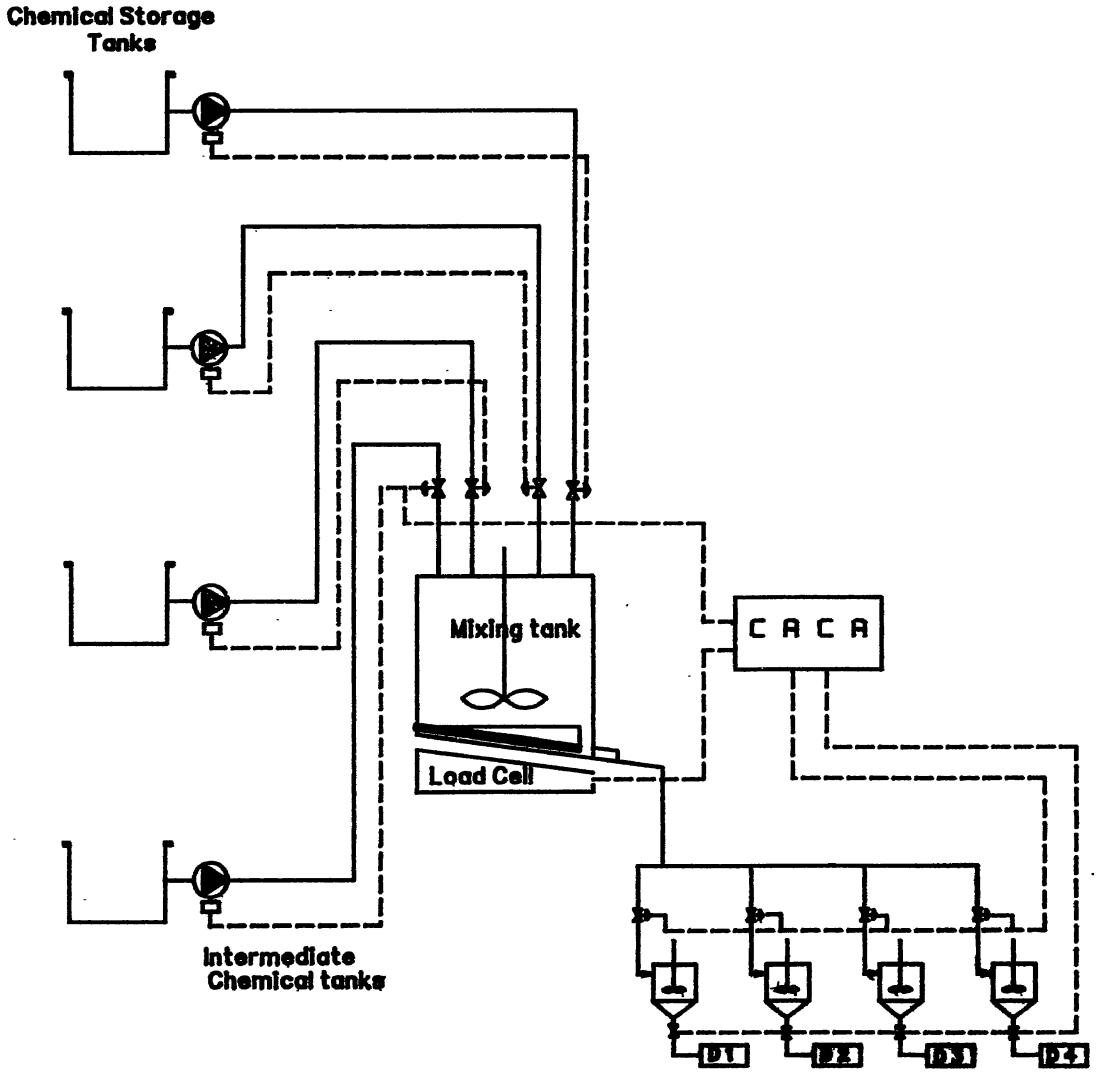
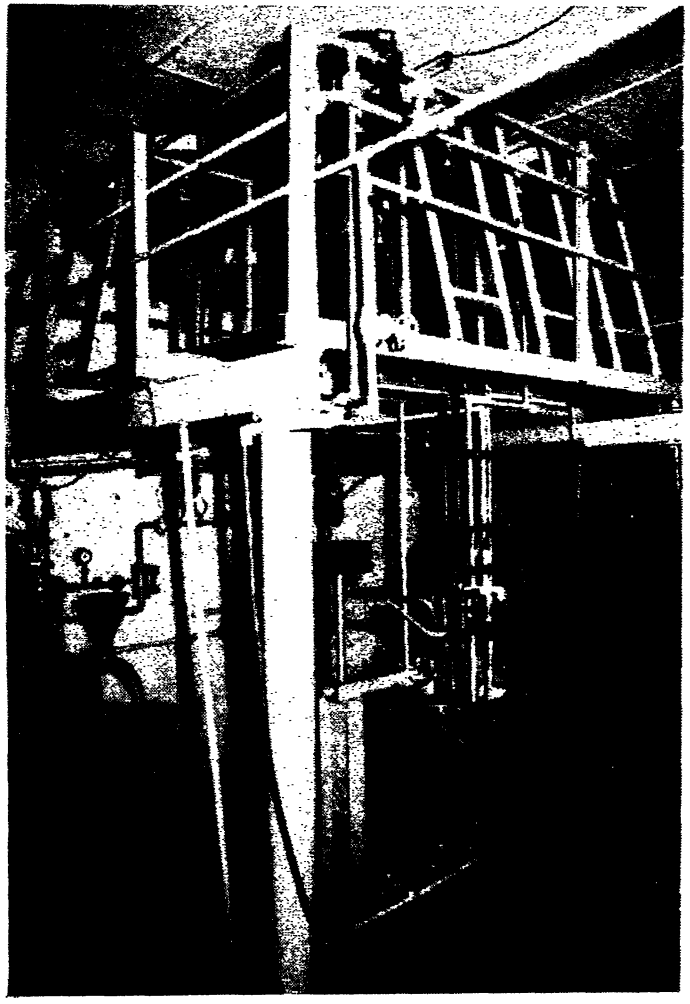


Fig. 1. COMPUTER ASSISTED CHEMICAL ADDITION SYSTEM



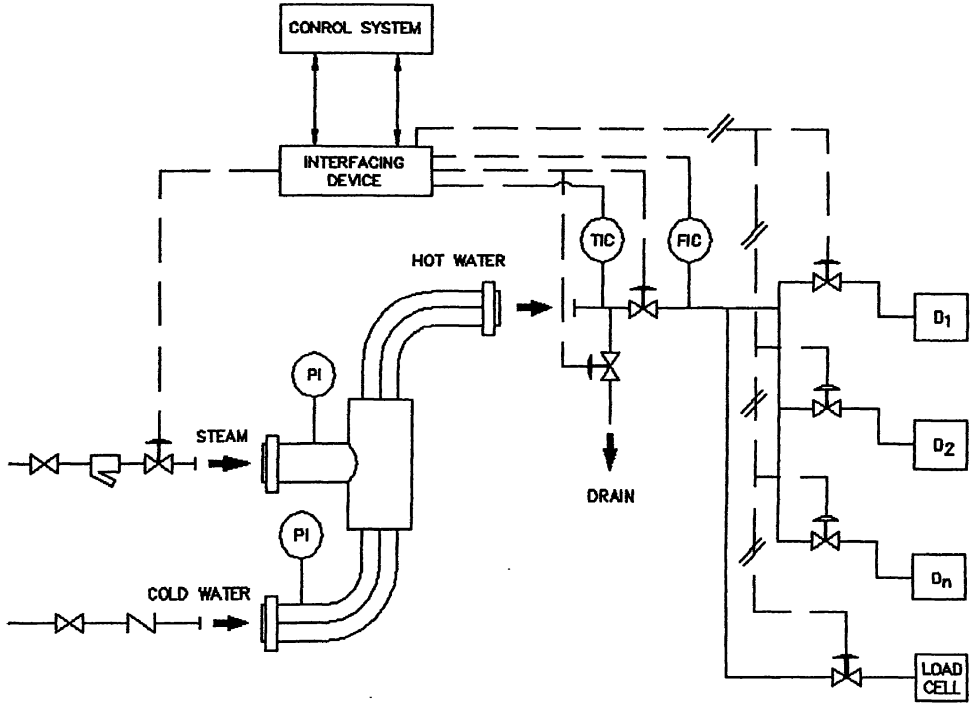
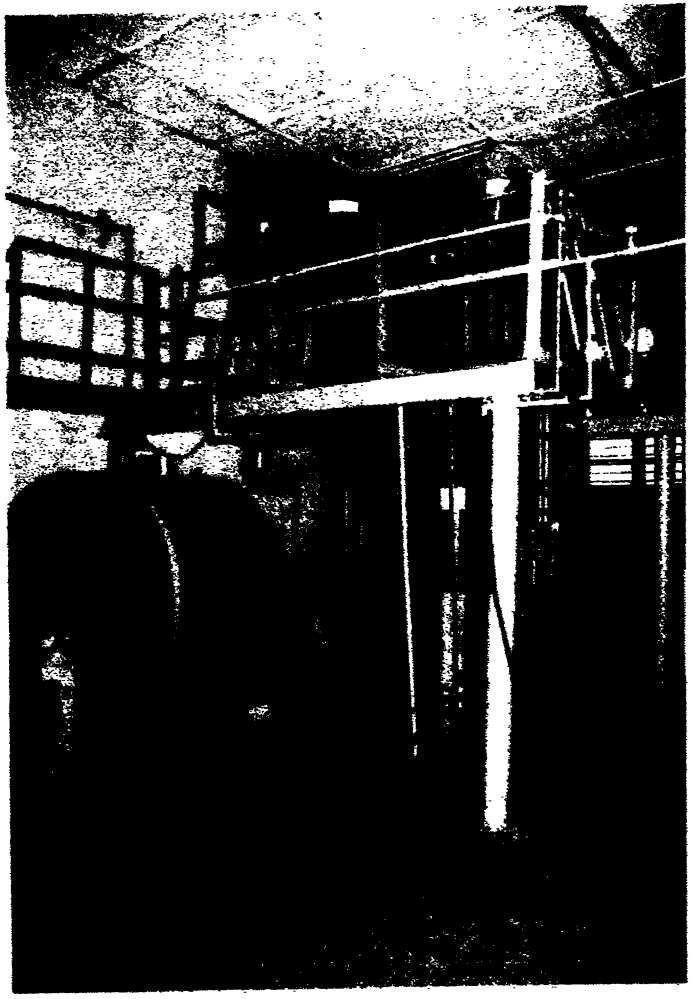


FIG.2. COMPUTER ASSISTED WATER ADDITION (CAWA) SYSTEM



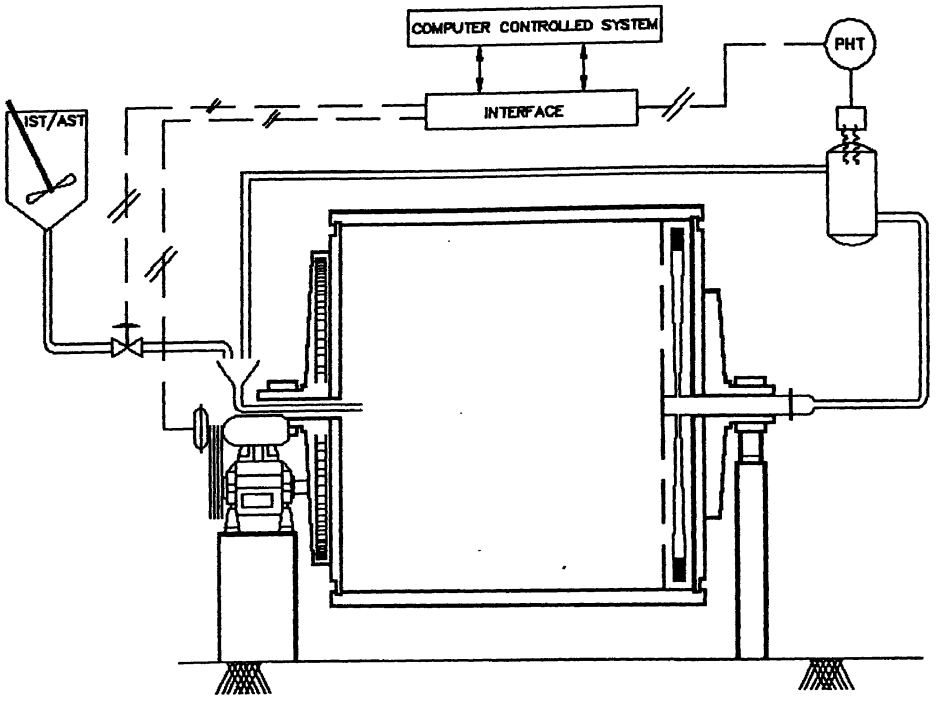


FIG.3. pH AND DRUM CONTROL MODULE

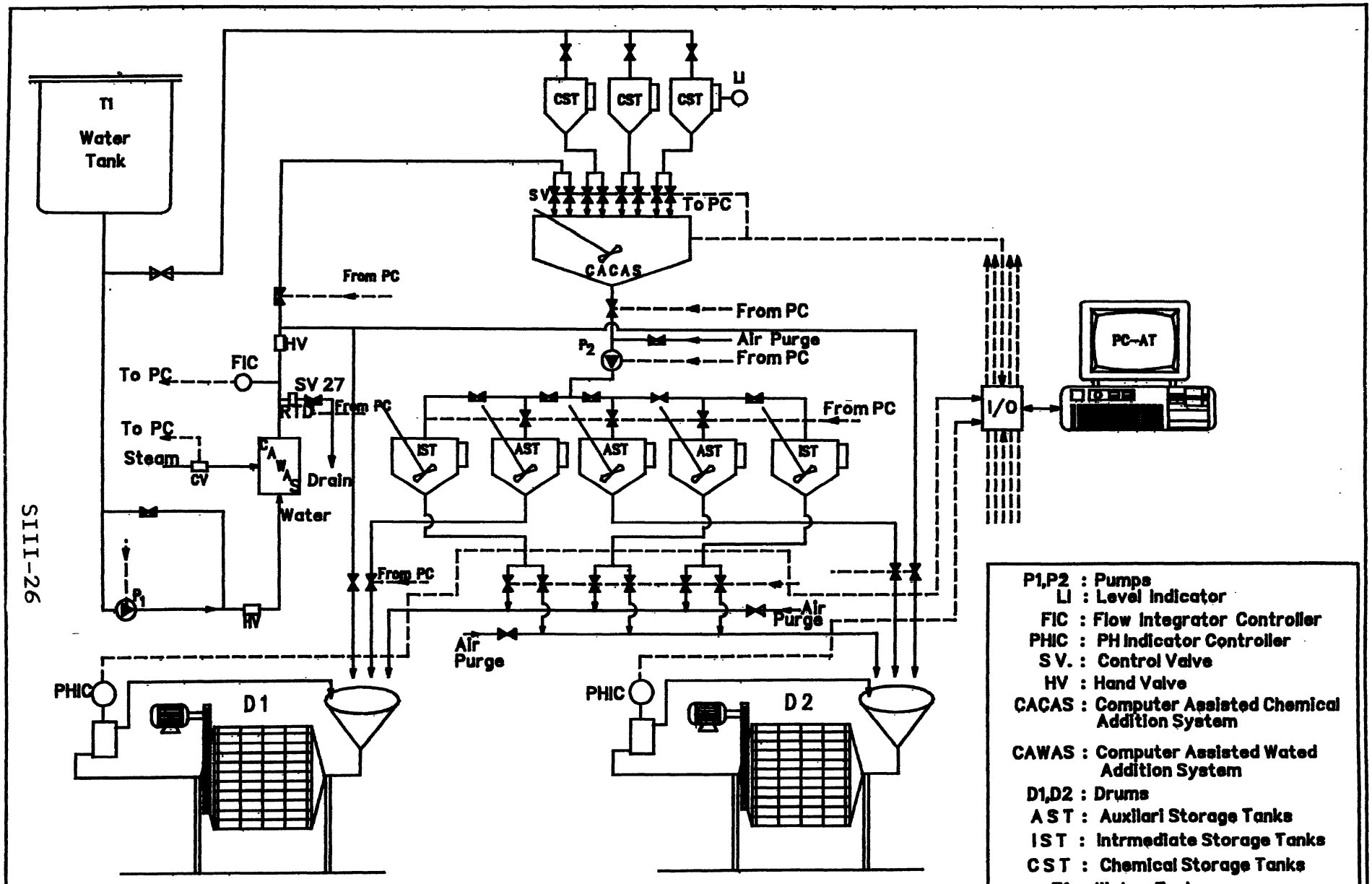


Fig. 4. P & I DIAGRAM FOR COPUTER CONTROLLED PILOT TANNERY

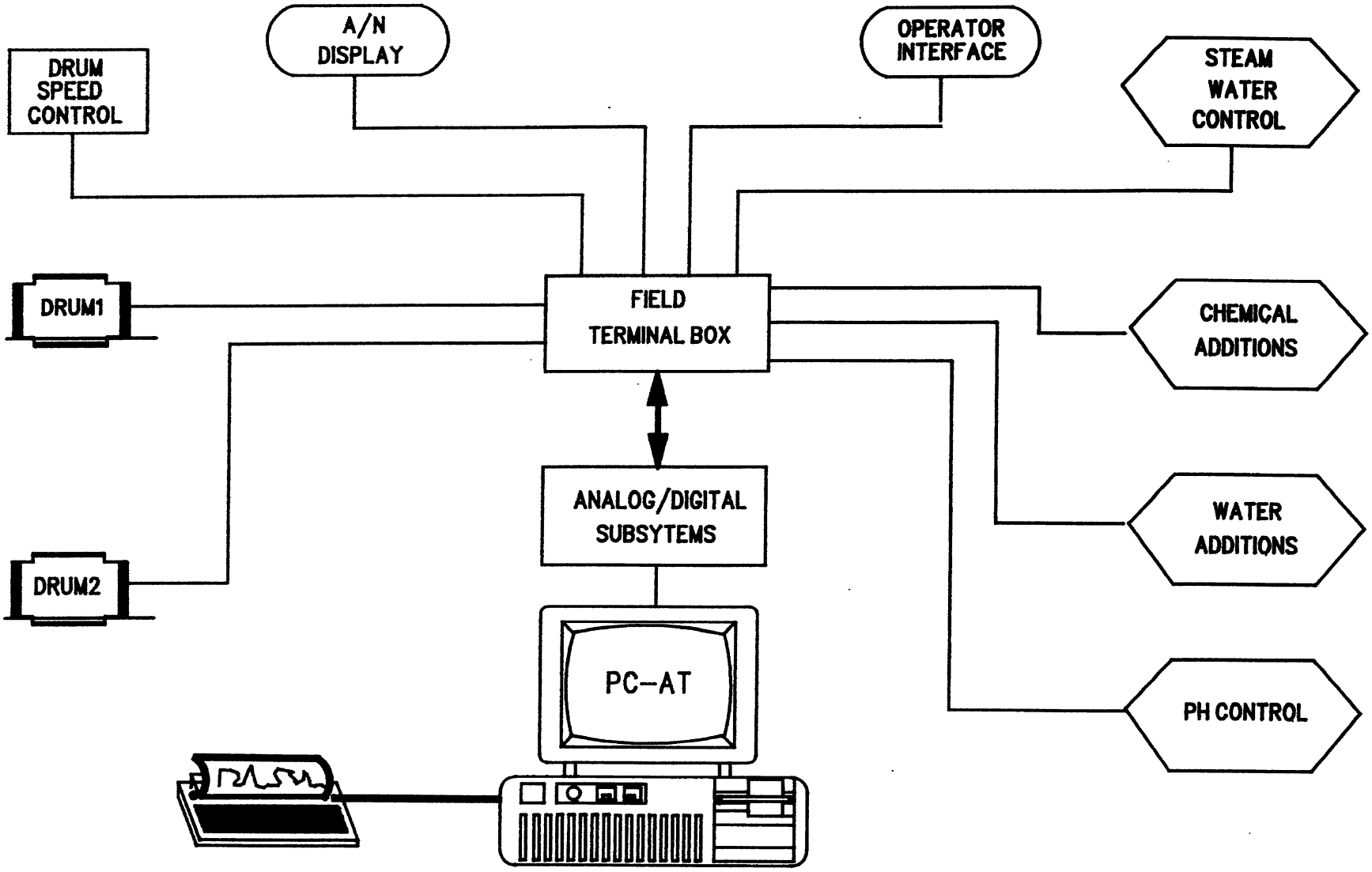
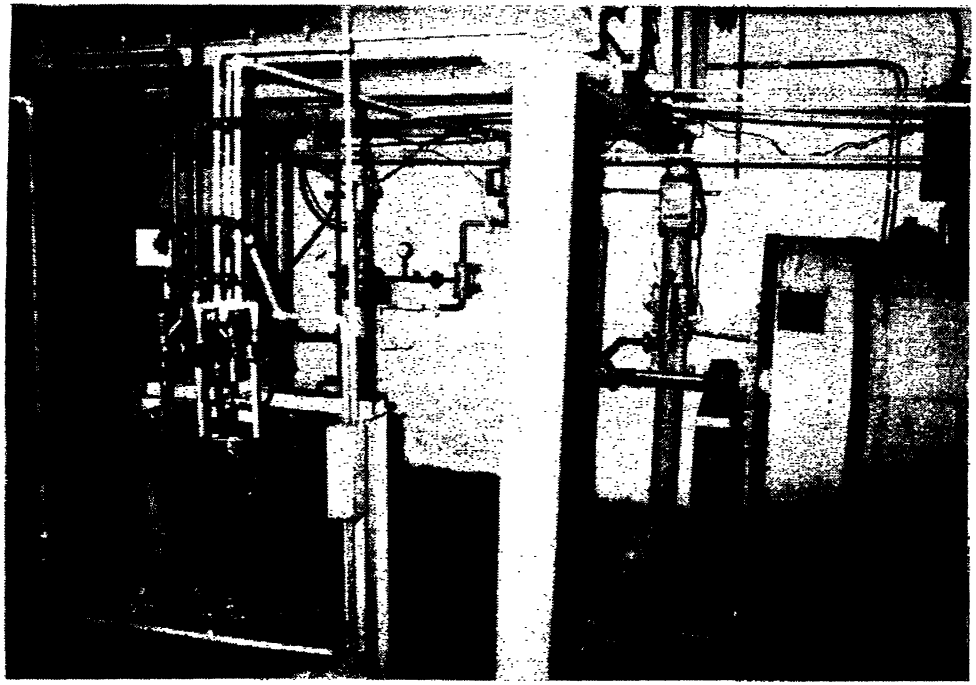


Fig. 5. COMPUTER CONTROL OF TANNERY WET OPERATIONS



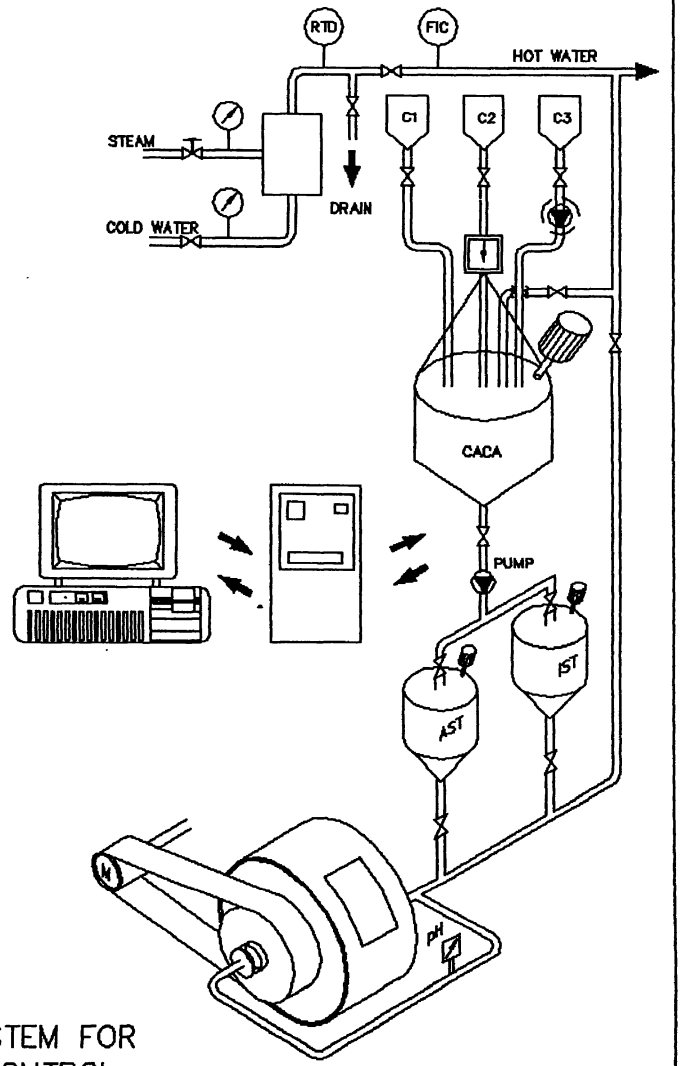


FIG 6. COMPUTER ASSISTED INTEGRATED SYSTEM FOR CHEMICAL AND WATER ADDITION AND pH CONTROL

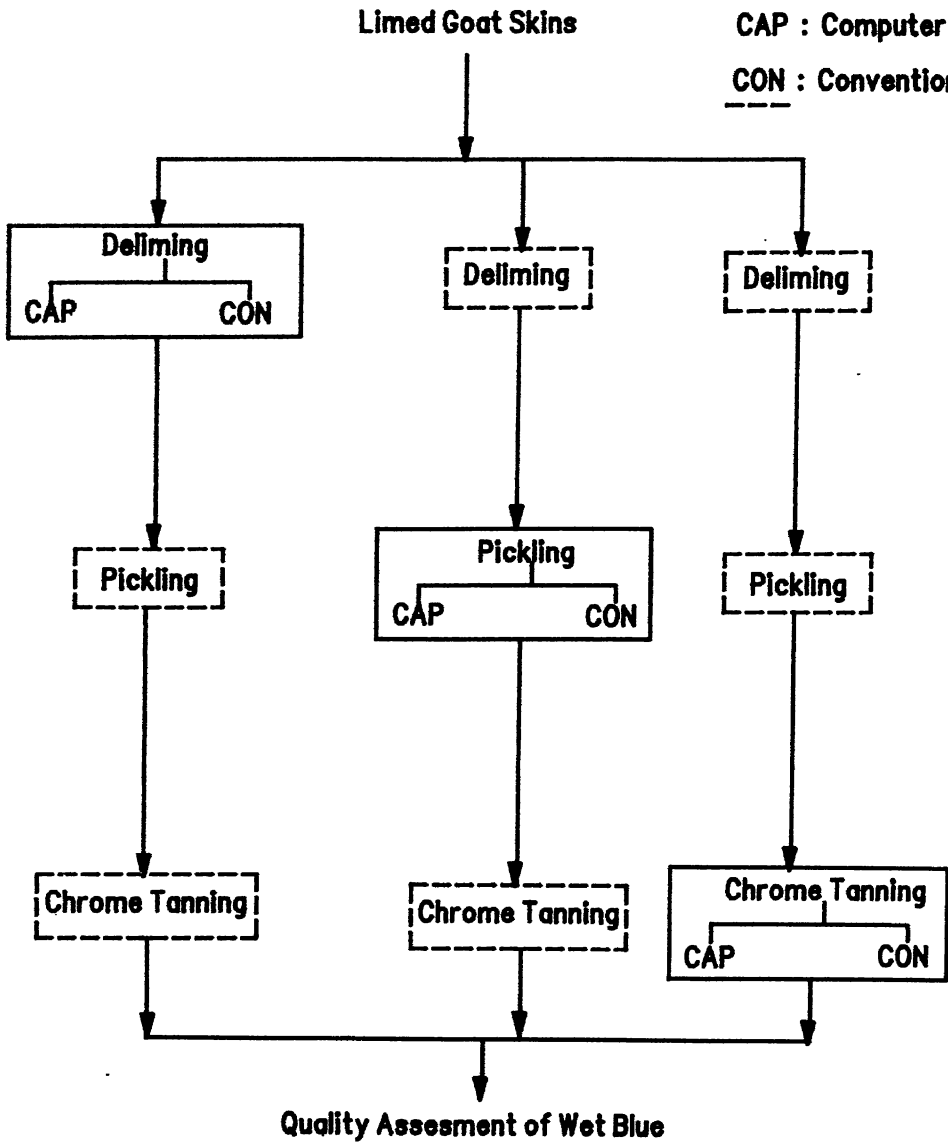


Fig. 7. STRATEGY ADOPTED FOR PRE TANNING

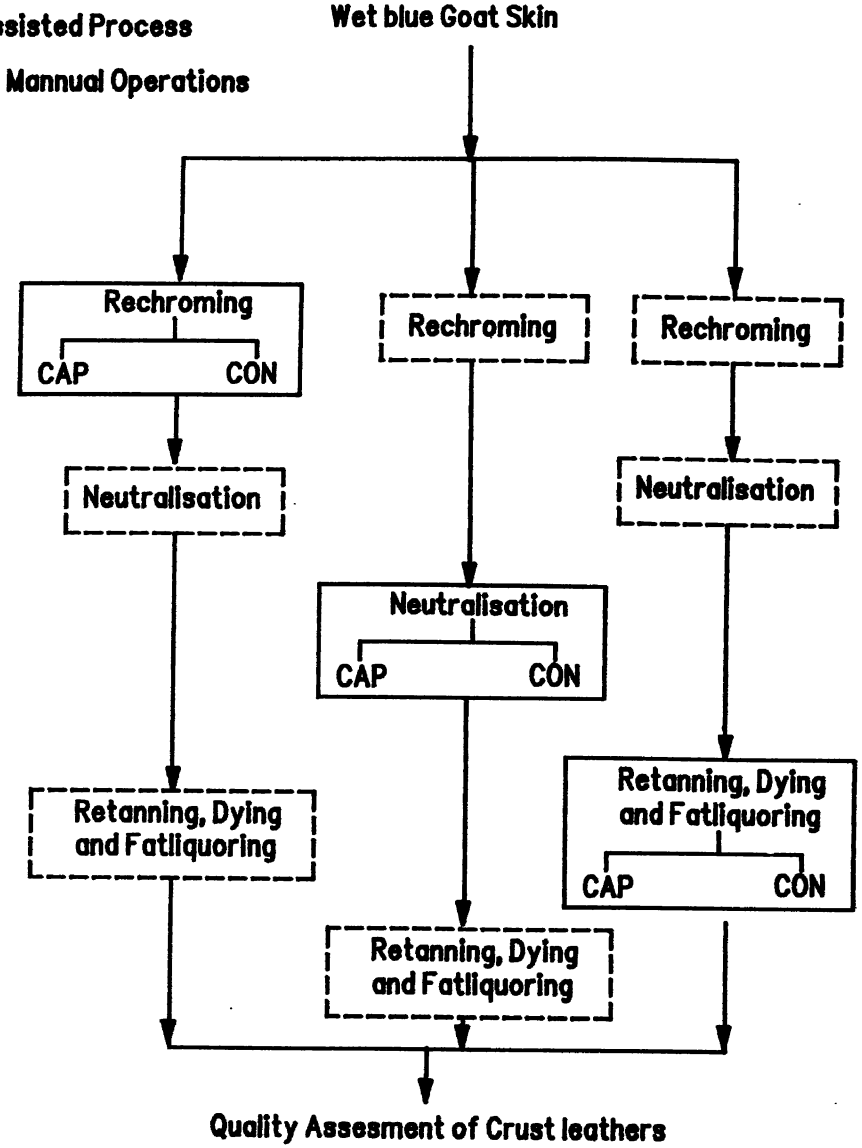


Fig. 8. STRATEGY ADOPTED FOR POST TANNING OPERATIONS

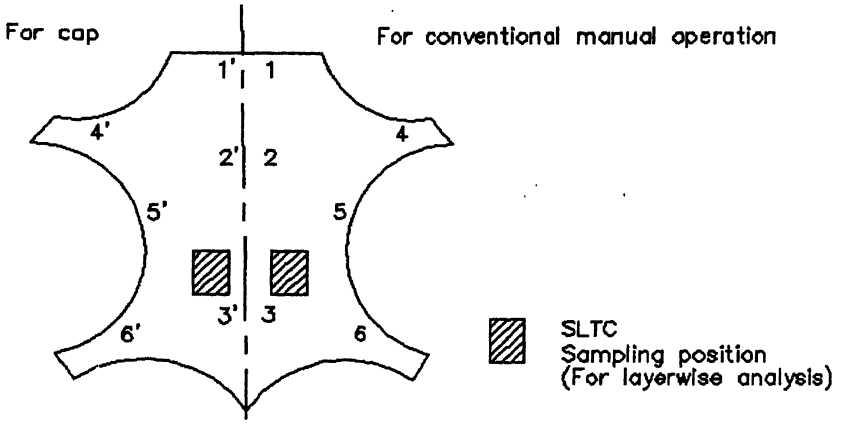


FIG.9 SAMPLING POSTION FOR ANALYSIS

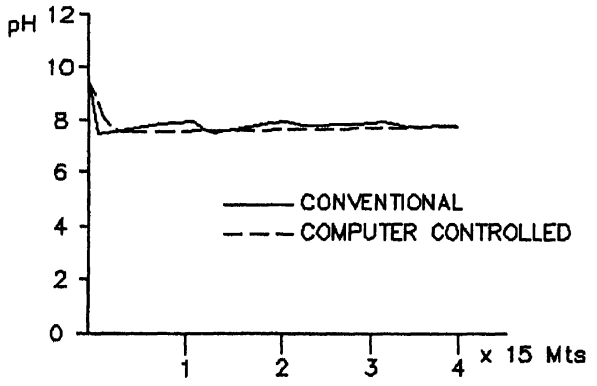


FIG 10 pH PROFILE OF DELIMING PHASE

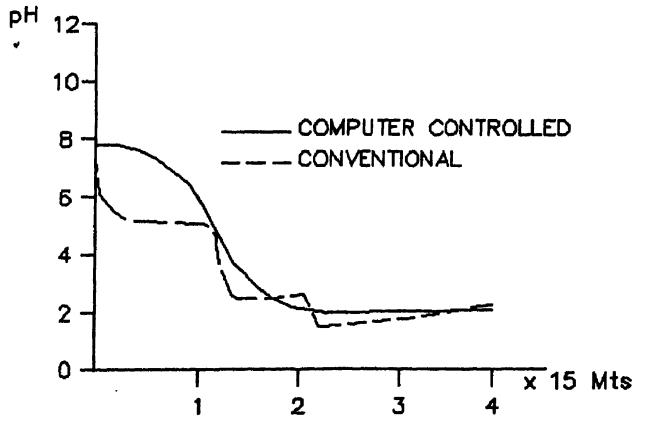


Fig 11 pH PROFILE OF PICKLING PHASE

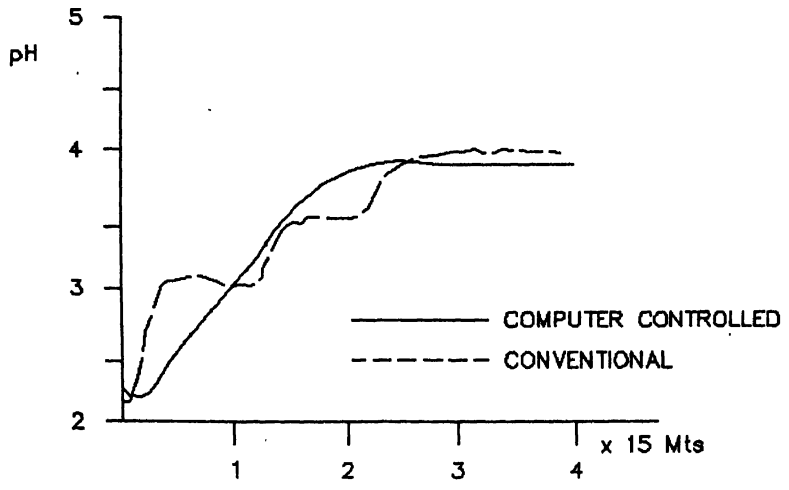


FIG 12 pH PROFILE OF CHROME–TANNING PHASE

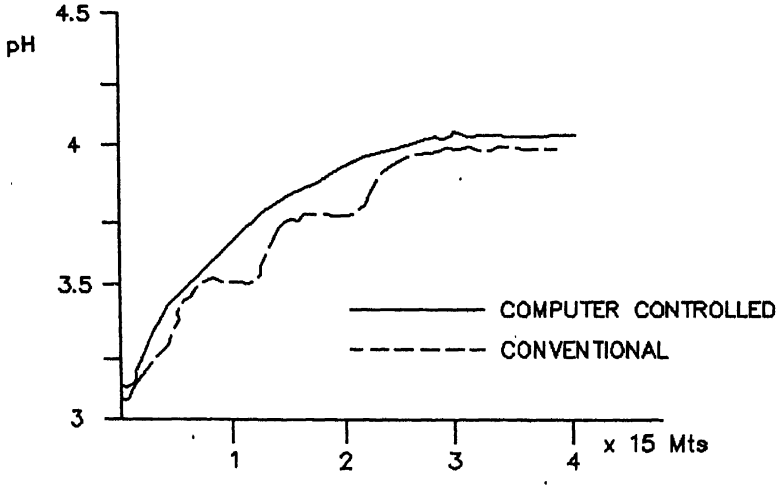


FIG 13 pH PROFILE OF RECHROMING PHASE

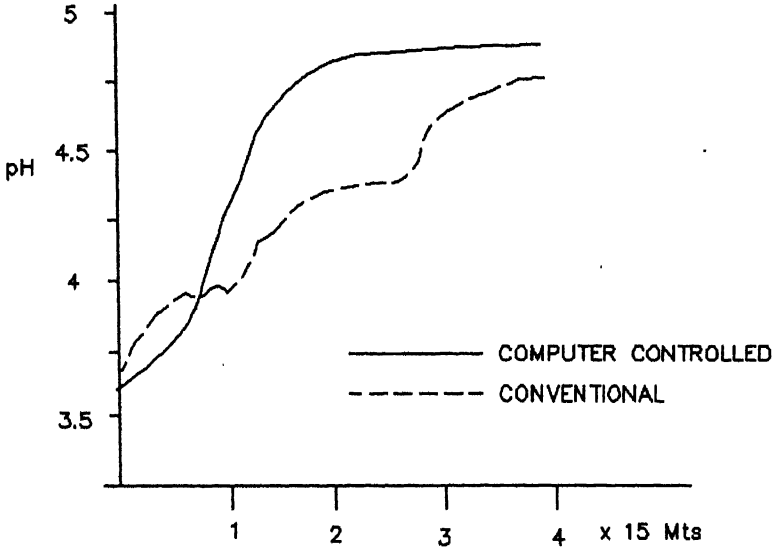


FIG 14 pH PROFILE OF NEUTRALISATION PHASE

COMPUTER CONTROL OF TANNERY WET OPERATIONS PART I I

P E SANKARANARAYANAN, G PRASAD, B SUNDARESAN, C A THOMAS AND S UMA

CENTRAL ELECTRONICS ENGINEERING RESEARCH INSTITUTE MADRAS CENTRE, CSIR CAMPUS, MADRAS 600 113

1. INTRODUCTION

Modernization of any process industry through use of computers was just a dream, particularly in India, till recently as it used to involve huge investment. Presently, the low cost microprocessors, having abundant computing power, have changed the scene and brought this dream into a reality for many process industries by bringing the expenditure involved for modernisation within affordable reach. Since then, these microchips are being put to use in many industries like steel, paper & pulp, sugar etc, and now leather industry is also no exception to this. The competition in leather industry is now forcing the country to improve the quality of product, increase productivity, conserve chemicals and energy. It is highly impossible for the leather industry in our country to face this uphill task unless they change their present conventional manual processing into computerised processing/control. Keeping all these problems of the industry in mind, Central Electronics Engineering Research Institute (CEERI) Madras Centre and CLRI have jointly developed a computerised processing/control system for tannery wet operations, ideally suited for small and medium scale tanneries. The role of CEERI Madras Centre has been to interact with the process personnel of CLRI, study the process and develop an appropriate microcomputer based processing system-both hardware and software, with control capabilities, help integrating the system in their pilot tannery to enable field trials of the system as a whole and participate in the technology transfer.

2. PROCESS OVERVIEW

To provide computerised control of tannery wet operations, a complete study and understanding of the particular process is necessary. Tanning is a very slow process and runs for hours. Although, tanning operations are essentially sequential in nature, for certain operations like hot water and chemical additions, closed loop control in addition to monitoring, may have to be incorporated. However,about 90% of the tannery

operations require just monitoring of critical parameters. These could be summed up as under.

* Water additions into the drum.
* Control of chemical additions into the drum based on the pH values.
* Solutions like fatliquor and formic acid are to be prepared and added into the drum.
* Drumming times, durations and speeds are to be controlled.
* Water is to be maintained at a particular desired temperature during retanning, dyeing and fatliquoring stages.

A microcomputer controlled processing system which provides all the above features would then be very valuable from the point of view of improving the quality, increasing productivity, conserving chemicals and energy. In addition, if such a system could accommodate, say, 8 drums in a tannery, it could then be operated in a centralised fashion and may become cost effective also. We have taken into consideration the above requirements and implemented a scheme for microcotmputer control as shown in Fig.1.

3. COMPUTER CONTROL IMPLEMENTATION

In the processing of leather, the skins or hides have to pass through three phases of operations: pertaining, tanning andpost tanning. Operations pertaining to these phases are stored in the computer in the form of a recipe program. Once the required phase selection is made, the computer will start performing all the operations pertaining to phase one by one. During this operation, the details regarding the quantities of chemicals/water to be added or a chemical solution to be prepared and added into the drum as and when required automatically. The recipe program also contains information regarding drum speed in terms of RPM, drum rotation, duration and target pH setting. The program, is highly flexible wherein one can alter the values of various chemicals or the quantity of water to be added even when the process is going on. One can have one recipe for each batch and there is no limitation on the number of batches. The recipes can be altered or new ones can be created. A typical recipe page as seen on the computer video is shown in Fig.4.

The control implementation scheme employs both Independent and Dedicated Modules. The details of these modules are given below.

3.1. Independent Modules

Independent modules are those modules where the hardware is to be shared by all the drums. These pertain to the Load Cell Tank (LCT) weighing and the Flow Integration Control(FIC). The following operations are performed with these modules

* Preparation of chemical solutions
* Water additions

3.1.1. Module for the preparation of chemical solutions:

Chemical solutions are to be prepared intermittently while the process is on. Solutions like fatliquor and formic acid are to be prepared just a few minutes before adding them into the drum. This module is called and used while making the above solutions. The solutions are prepared in a tank which is supported by a Load Cell. All chemicals required for preparing the solutions are stored in storage tanks. The outlets of these storage tanks are routed into LCT along with water line. The quantity of water and chemical are weighed in this tank and later pumped into an intermediate tank from which the solution is added into the drum. The module also contains/operates a digital panel meter (DPM) to facilitate the user to add powders also while preparing the solutions. This module is shared by all the drums and the system software will keep track of the data pertaining to the drum for which the solution is being prepared and to transfer. If more than one drum asks for this LCT module service,the one that has asked first will be served first and others will be put in the queue and will be attended to in their order in the queue.

3.1.2. Module for water additions:

This module consists of a flow integral control (FIC) unit which is connected to all the drums. This unit is once again shared by all the drums in the plant. When this module is serving one of the drums and at that time if any other drum requests for the

service it will be put in the queue. There is no priority given to any drum and it is attended on first come first served basis.

3.2 Dedicated Modules:

Dedicated modules are the modules which are assigned to a particular drum and it will not be shared by other drums. The following operations are performed with these modules.

* pH monitoring and control
* Drum control

The above two modules can be used independent of each other irrespective of whatever operations being carried out in other drums.

3.2.1. Module for pH monitoring and control:

In tanning process, the completion of a particular operation\phase is determined mainly by means of pH values. For this very reason, this is an important module in the process. On-line samples are taken from the drum for measuring the pH at regular intervals. In this sample line, a pH probe with its transmitter is installed to provide 4-20 mA current corresponding to 0 - 14 pH. The main feature of this module is that whenever drumming takes place, the pH of the liquor is always made available and is displayed on the video screen. Now, based on the pH values, chemical additions to the drum are controlled. The user has to set the target value of the pH he desires to start with, in the recipe program itself. During the control phase, based on the target and current pH value, chemcial addition into the drum is done at every one minute and is stopped the moment the desired target pH is reached.

3.2.2. Module for drum control

The drum control module enables controlling the speed at which the drum is to be roated and the duration of the drumming. The target values are set in the recipe programe as before.

In tanning process, there are certain manual operations also. They are mainly, draining the float and adding some chemical powder into the drum. In such cases, the system stops for the operator to perform these operations and waits for a signal (by means of pressing a key) from the operator to continue further.

4. FUNCTIONS OF THE SYSTEM

The system exists mainly in two forms, viz, Hardware and Software. Hardware comprises primarily of electronic boards like microprocessor card, signal conditioning cards, AD/DA cards, Digital I/O cards, relay cards and filter cards. The software developed is menu driven, user friendly and flexible. All the pages are developed keeping the operator in mind and the information that he will be looking for. The developed software essentially integrates the system.

The first page that appears on the screen when the system is switched ON, is called the menu page as shown in Fig.2. This page enables the user to select other pages pertaining to the following functions.

* Drum initialisation
* Recipe
* Solution preparation
* Individual drum status
* pH trend
* Drum an load cell tank wash

Each of the above pages is dedicated to a particular set of information which may be of interest in controlling the tanning process. User can swap from one page to the other at any time. Details of these pages are provided in the following sections.

4.1 Drum initialisation page:

User has to use his page if a drum functions are to be initialised. A sample of this page is shown in Fig.3. Initialisation of a drum is purely asynchronous. This means one can initiate any drum at any time irrespective of whatever functions that are happening in other drums at that moment. Drum initialisation consists of the following.

* Drum selection
* Recipe selection
* Chemicals/water addition
* Phase selection
* Mode selection

The details on the above are as follows.

4.1.1. Drum selection

Any one of the eight drums can selected through this page. However, if an already selected drum is selected again, error will be indicated on the screen.

4.1.2. Recipe selection

Any one of the 50 preprogrammed recipes could be selected through this page. The chemical and such other additions will be done according to the selected recipe.

4.1.3. Chemicals/water addition

All information pertaining to addition of chemicals in the recipe are programmed in terms of percentage of weight of the skins used for tanning. The actual quantities of these chemicals/water to be used for tanning will determined based on this value.

4.1.4 Phase selection

The system that has been developed is meant primarily for post tanning operatirons. These operations are characterised into three phases viz, Rechroming, Neutralisation and Retanning, Dyeing and Fat liquoring. User can select one of these three phases to perform that particular operatiron in the drum.

4.2.5. Mode selection

Two modes viz, STEP and AUTO are provided for the user to choose one of them. In the STEP mode, while performing a series of operations pertaining to that phase, the

process will be stopped aftr completing each operation till the operator intervenes and restarts. This feature will will be useful for the operator to inspect the skins after each operation. In the AUTO mode, the process will move to the next operation automatically without halting. When all the above Information are keyed, the particular drum is said to be initialised.

4.2 Recipe page

A Recipe page, shown in Fig.4 is a programmable page which enables the user to programme and store various combinations of recipies for later use. The recipes are numbered and the contents in each one can be altered at any stage of the process and these changes will be inforce from then on. The operator can select a maximum of 3 chemical compositions in preparing a solution during the process. The drumming time, drum rpm and target pH are also initiated through this page.

4.3 Solution preparation page

The operator has to select this page for preparing/monitoring chemical solutions in load cell tank. Preparation of solutions is initiated by the system without affecting the drum operations. A maximum of three combination of chemicals can be used as mentined above. In case of liquid chemicals, the system enables opening the valve in the outlet of the corresponding storage tank. The amount of chemical added into the tank by weight is displayed both on the video screen as well as in the DPM positioned near the LCT. If the chemical happens to be a powder, it may have to be added manually into the tank till the specified quantity is displayed, again by weight, on the DPM.

Once the chemical solution preparation is complete, the system will identify which drum had asked for that solution and accordingly pump it to the corresponding intermediate tank. From here, the solution is added into the drum as a whole or at specified feed rate. A typical page is shown in Fig.5.

4.4. Individual drum status page

This page enables scanning the current status of each drum. All the status information pertaining to any drum selected can be seen on this page. The operator can

see on the video screen informatiorn pertaining to the completed operations and operatirons to be done. Information regarding when the phase had started, the water temperature, drum rpm and drum duration that has been set and the elapsed time are also provided in this page. If the operation is something like water addition or chemical addition, the operator can see the target quantity to be added and the quantity so far added apart from giving the pH value. The operator will be on this page most of the time. A schematic of the individual drum status page is shown in Fig.6.

4.5 pH trend page

As the name suggests, this page is primarily used to provide the trend of pH parameter of the solution in the drum in real time. The trend is plotted based on monitorting pH every one second. On the same page, it is possible to view the pH trends of solution in other drums which are also in use. A typical pH trend curve is shown in Fig.7.

4.6 Drum/load cell tank wash page

Drums and Load cell tank may need a wash before starting a fresh phase of operation. The washing operatirons are to be performed without disturbing the process that are going on in other drums. The system takes care of this feature as well. It is again a menu driven page and the operator can select any drum. As far as wash is concerned, a predefined quantity of water is added into the drum and it is rotated normally for 10 minutes. Load cell tank is to be washed after every solution preparation. This is initiated by coming to this page which is shown in Fig.8.

5. DIAGNOSTIC FEATURES

The system while keeping a watchful eye on the process is also capable of checking the performance of its hadrdware. For example,if a command is given to open a p[articular valve, the system will check for the opening of that valve and then only continue further. If it is found that the valve has not opened, then the system gives an alarm signal to the operator indicating that the valve has not opened facilitating the operator to change over to the manual mode of operations and continue the process till

the defect in the valve is rectified. The system also has its own start up and shut down procedures.

6. RESULTS AND CONCLUSIONS

The above described computer system has been put to trials in the pilot plant of CLRI and the results are encouraging. The process has been tried on a single drum to start with, and now being made to accommodate a second drum. The results have shownuniform penetration of chemicals into the leather which is very essential to produce good quality leather. Presumably, this has been made possible by the pH control loop. Accurate addition of chemicals and water in known quantities into the drum during various operations of the tanning process also contributed to producing uniform/good quality leather. With the system, the workers are fairly free from doing monotonous/ laborious work like adding water into the drums using buckets. Sufficient amount of process time is saved either by eliminating or curtailing many manual operations like, opening the drum to check the pH values of the process and water addition using buckets.

When multiple drums are operating, the operator can scan the current phase/operations that is in progress at that instant in any particular drum. This will be of great boon for the plant working in shifts. During change over of shifts, the new operator can take over from exactly where his predecisor has left. He now needs no briefing from any one since from the video screen he will know the operational status of the drums. Hard copies pertaining to the details of the total amount of time being taken and quantities of water and chemical used in a particular batch, shift, day or month can be obtained. It also gives the production reports pertaining to the shift, day week and monthwise which could prove very useful to the management.

The entire software developed and used is user friendly and any non-technical operator can use the system with little familiarisation.

The system is appropriate in its suitability for use in all types of Indian tanneries, particularly in small and medium scale tanneries. It is expected that there will be at least 10% savings in the process time and 5% savings in chemical usage. This means increase in production and savings in cost. There will be substantial improvement in the

quality of leather processed since the process is controlled objectively by a computer. The system will also help saving water usage. Management could now have the complete statistical information of the process.

The salient features of the system developed and field tested are given below.

* All the sequential operations of varitous phases of tanning process are read and executed one after another. Wherever manual operations are to be executed, the sytem will halt and indicate the operator what is to be done and what quantities of various chemicals to be added into drums or the LC tank.

* All additions into the drum or LC tank will be accurately weighed and added. This will reduce wastage of chemicals and also help in improving the quality of leather.

* The system is equipped with a flexible recipe program, through which the tannery operator can change the recipe at any stage of the process.

* Chemical solutions such as fatliquor, forming acid, etc., are prepared automatically by the system in the LC tank and without operators interference, it will be added into the drum.

* Independent drum operations is another feature of the system and can initiaise or cancel the drum operations at any time of the process.

* Print-outs pertaining to chemical/water additions and total time taken for a particular phase to complete etc., are made available. User can also have the hardcopy of the production details.

* Capability to control up to 8 drums.

* pH value of the chemical in the drum is always available for user.

* Since Indian companies, small in scale, they cannot compete with giant companies. It is feared that the quality regulations will be made stricter after the unification.

* If effective steps are not taken by Indian exporters, to upgrade the standard of the products, these anticipated regulations may jeopardise its export prospects.

* The existing trade concessions offered by some of the EEC countries may likely to be withdrawn in the unified Europe.

* In course of time, EEC may likely adopt discriminatory and protectionistic policies to avoid competition from low wage countries like India. It is also envisaged that the unification may contribute for economies of scale and greater efficiency in production which would bestow greater strength to its export industries and import substitution.

* Another school of thought visualises optimistic scenario - the market integration may reduce cost of production, rate of inflation and stimulate economic efficiency and encourage job creations which in turn are expected to enhance the demand for consumer products. The unified market will open up new export opportunities for the developing countries in view of its expanded size and uniform trade and investment regulations. Instead of 12 fragmented markets with different rules and regulations there will be one market with one set of rules and regulations to meet the requirements of 320 million people.

* Obviously, opportunities for firms outside EEC will depend on their dynamism in capturing them. Within EEC, restructuring of industries towards vertical expansion from small scale to medium and large scale is envisaged. New technologies, automated production techniques, quality control measures are some which may gain greater importance.

* The system is provided with a suitable backup facility to meet the the situation arising out of any power failure.

* The system, both hardware and software, are totally indigenous and uses a PC/AT as the Process Computer and some additional hardware.

* Easy to operate and maintain.

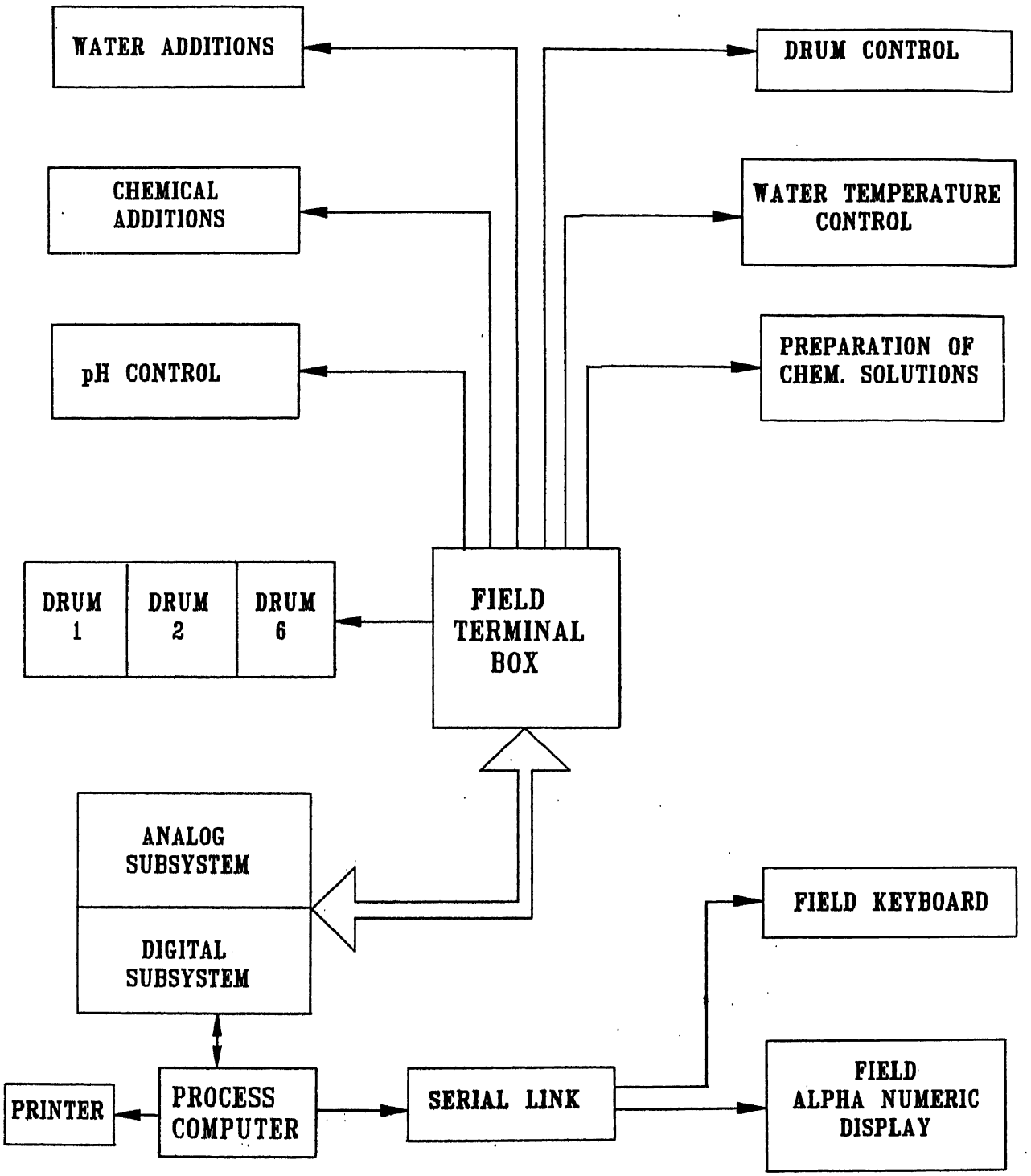


FIG.1. SCHEMATIC OF LEATHER PROCESS CONTROL

CEERI COMPUTER CONTROL OF LEATHER PROCESS CLRI

MENU PAGE

DATE: 01 - 23 - 1991 LEATHER PROCESS CONTROL TIME: 15 : 32 : 28

MAIN MENU

1. DRUM INITIALISATION
2. RECIPE PAGE
3. PREPARE SOLUTION
4. INDIVIDUAL DRUM STATUS
5. pH PAGE
6. PRINT DATA PAGE

DRUM 1: CHARGE SKINS & PRESS F1 KEY

↓: NEXT OPTION ESC TO QUIT ↑: PREV.OPTION

FIG. 2 MENU PAGE

CEERI COMPUTER CONTROL OF LEATHER PROCESS CLRI

PAGE - 4

DATE: 01- 23 - 1991 DRUM INITIALISATION PAGE TIME: 16: 10: 25

DRUM DETAILS

DRUM NO. (1 or 2) : [1]

Serial No. (Max. 99999) : 1

BATCH No. : 1

Basis (Kgs) (Max. 9999) : 50

PHASE SELECTION

RECHROMING PHASE

NEUTRALISATION

RETAN,DYE AND FAT LIQ

STEP AUTO

SPACE BAR to Choose : RET to Select

Press ESC to QUIT page

FIG. 3 DRUM INITIALISATION PAGE

CEERI COMPUTER CONTROL OF LEATHER PROCESS CLRI

DATE : 01 - 23 - 1991 PAGE - 1 TIME: 15: 41: 29
PHASE: RECHROMING PHASE RECIPE PROGRAM PAGE BATCH NO. 1

S.NO	PRODUCT NAME	COMP - 1 NO	%	COMP - 2 NO	%	COMP - 3 NO	%	T.pH	DRUM TIME	DRUM RPM
1	WATER	12	100.0							
2	ACETIC ACID	4	0.5						10	8
3	WATER	12	100.0							
4	CHROME SY	5	5.0						60	8
5	ALKALI 1	12	10.0	1	0.5	2	0.5	4.0	60	8

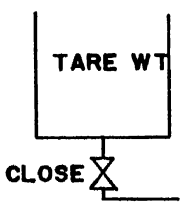
F1.. HELP RETURN..EDIT VALUES SPACE BAR..NEXT PHASE ESC..QUIT

FIG. 4 RECIPE PAGE

CEERI COMPUTER CONTROL OF LEATHER PROCESS CLRI

DATE : 01 - 23 - 1991 PAGE - 2 PRODUCT WEIGHING TIME : 16: 14: 11

WEIGHING TANK



TOTAL (In Kgs) : 3.47

PARTIAL (In Kgs) : 0.46

SOLUTION : FATLIQUOR
DRUM No. : 1
DRUMS IN Q : 0
TANK STATUS : BUSY

DRUM DETAILS
DRUM No. : 1
BASIS WT. : 15
BATCH No. : 1

Sl.No.	PROD. No.	PROD. %	PROD. Kgs	PROD. ACT	STATUS
1	13	20%	3.0	3.01	OVER
2	8	5%	0.75	0.46	DOING
3					

ADDING FATLIQUOR

ESC TO QUIT

FIG. 5 SOLUTION PREPARATION PAGE

CEERI COMPUTER CONTROL OF LEATHER PROCESS CLRI

PAGE - 5

DATE: 01 - 23 - 1991 INDIVIDUAL DRUM STATUS TIME: 16: 22: 18

DRUM No. : 1

BATCH No. : 1

BASIS WT:: 50.00

CURRENT PHASE : RECHROMING

OPERATION	STATUS
WATER	Doing
ACETIC ACID	
DRUMING	
DRAIN FLOAT	
WATER	
CHROME SYNTAN	
DRUMMING	
DRUMMING + ALKALI - I	
DRAIN FLOAT	

SET QNT (kgs)	ACT QNT (kgs)
50.00	27.00

DRUM

RPM:

TEMP : 25.3°

Drum Time (Mins)	El. Time (Mins)

SET pH

CUR.pH

START TIME
15: 15: 42

DRUM 1 : WATERING . .

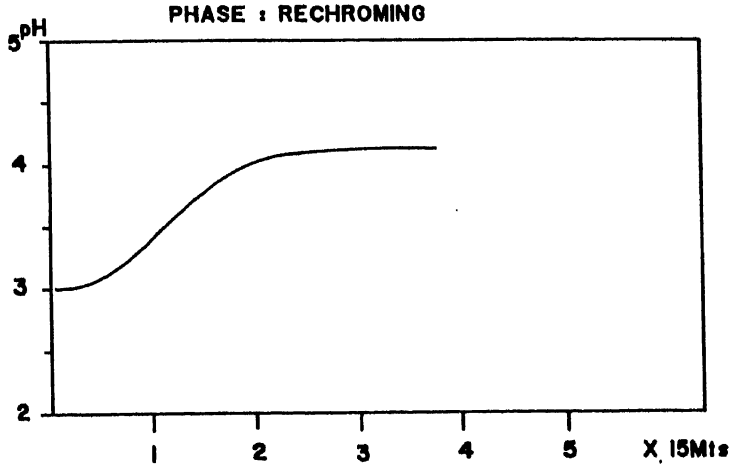
↓: NEXT DRUM ESC TO QUIT ↑: PREV.DRUM

FIG. 6 INDIVIDUAL DRUM STATUS PAGE

CEERI COMPUTER CONTROL OF LEATHER PROCESS CLRI

DATE : 01 - 23 - 1991 PAGE - 3 pH MONITOR PAGE TIME: 16: 19: 52

PHASE : RECHROMING



DRUM No. : 1

Current pH : 4.0

Target pH : 4.0

Init. pH : 3.0

START TIME
15: 29: 40

Ela. Time Minutes	Set Time Minutes
50	60

DRUM 1 : DRUMMING . .

↓:NEXT DRUM ESC TO QUIT ↑: PREV.DRUM

FIG. 7 pH PAGE

CEERI COMPUTER CONTROL OF LEATHER PROCESS CLRI

DATE : 01 - 23 - 1991 DRUM PREPARATION PAGE TIME : 16: 26: 40

DRUM / LC WASH

WASH DRUM 1

WASH DRUM 2

DRUM 1 ROTATION

DRUM 2 ROTATION

WASH LC TANK

DETAILS

WATER QUANTITY ADDED 18.57Lts

ELAPSED DRUM TIME : 1 Mts

pH VALUE : 4.5

DRUM NO. : 1

↓: NEXT OPTION ESC TO QUIT ↑: PREV.OPTION

FIG. 8 DRUM / LC WASH PAGE

CHROME RECOVERY AND REUSE

J.E.SCHAAPMAN*
Haskoning, Royal Dutch Consulting Engineers and Architects, Nijmegen, The Netherlands
And
S RAJAMANI AND G THYAGARAJAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

1. INTRODUCTION

The leather industry is one of the oldest and fast growing industries in India. There are 2000 tanneries spread all over the country with an annual processing capacity of 500,000 tonnes of hides and skins. More than 80% of these tanneries apply the chrome tanning process. In chrome tanning operations about 60% of the chromium applied is absorbed by the leather and the remaining is discharged in the wastewater. Annually 25,000 tons of chromium salt is used and out of this 10,000 tonnes of chromium salt in the form of Basic Chromium Sulphate (BCS) is discharged into wastewater streams causing environmental pollution. This also makes the wastewater treatment and sludge disposal complicated and costly.

The environmental pollution problems arising from the discharge of untreated effluents from tanneries with high chromium content and other pollutants has become a matter of increasing concern. Pollution prevention in conjunction with **Clean Technologies** is a good option for tannery waste management problems. The clean technologies including chrome recovery and reuse developed and adopted in other countries, cannot be replicated in India without modifications due to the traditional nature of the tanning process applied, characteristics of the effluent, their discharge pattern, technical manpower capabilities in tanneries, local environmental conditions etc. Therefore, it has become necessary to develop an appropriate technology to recover and reuse the chrome in Indian tanneries.

Within the framework of the Indo-Dutch Environmental and Sanitary Engineering Project in Kanpur, under Ganga Action Plan a simple chrome recovery system has been

---

* **Mr J.E Schaapman: Project Director, Indo-Dutch Environmental and Sanitary Engineering Project, Kanpur - Mirzapur, on behalf of HASKONING, Royal Dutch Consulting Engineers and Architects, Nijmegen, The Netherlands.**

introduced in the tanneries of Kanpur. The Central Leather Research Institute (CLRI) in Madras, TNO/ILS from The Netherlands, AIC and IRAMCONSULT from India and EUROCONSULT from The Netherlands were associated with HASKONING, Royal Dutch Consulting Engineers and Architects in the development. U.P Jal Nigam was the implementing agency. The pilot plant studies were carried out at Pioneer Tannery in Kanpur.

Parallel to the chrome recovery pilot plant studies at the same tannery a 40 m^3/day Upflow Anaerobic Sludge Blanket (UASB) plant was constructed for treatment of tannery wastewater. The aim of this pilot plant was to established the mixing ratio between tannery wastewater and domestic wastewater in order to achieve an efficient treatment of tannery wastewater under anaerobic conditions. The pilot plant was in operation between April 1989 and March 1990.

2. CHROME TANNING PROCESS AND WASTEWATER DISCHARGE

Salted hides and skins undergo a number of operations like: soaking, liming, fleshing, deliming etc. as shown in Figure 1, in order to get clean material prior to chrome tanning operations. Soaking and liming are carried out in pits and paddles, fleshing is done with machines and deliming is carried out in paddles. Most of these operations are carried out in batches and the wastewater discharges are intermittent and in slugs. Chrome tanning takes place in drums in which it is possible to move the hides continuously in the float. The first step is to acidify the hides in a solution of salt (NaCl) and sulphuric acid which is called pickling. Tanning is carried out by adding Basic Chromium Sulphate (BCS), a readymade chromium product, to either the pickle or in a separate bath. In chrome tanning operations about 100% water on the basis of hide/skin pelt weight, 6-8% BCS, and 20% sulphuric acid are added and the drum is operated for 5-7 hours. The exhaust liquor is discharged as waste and the hides/skins after this operation are called wet blue (semi finished leather). This wet blue is further processed to produce finished leather.

The normal tannage in Indian tanneries is not very well controlled and the nature of the chromium salt and the conditions employed for tanning are such that at the end of the tannage the waste liquor contains 30-40 % of the added quantity of chromium salt. Some tanning systems make it possible to decrease the chromium content in the waste liquor to less than 10% by using sophisticated drums and other control systems. However, high exhaustion of chromium is not practicable in most of the Indian tanneries with the existing drum and facilities.

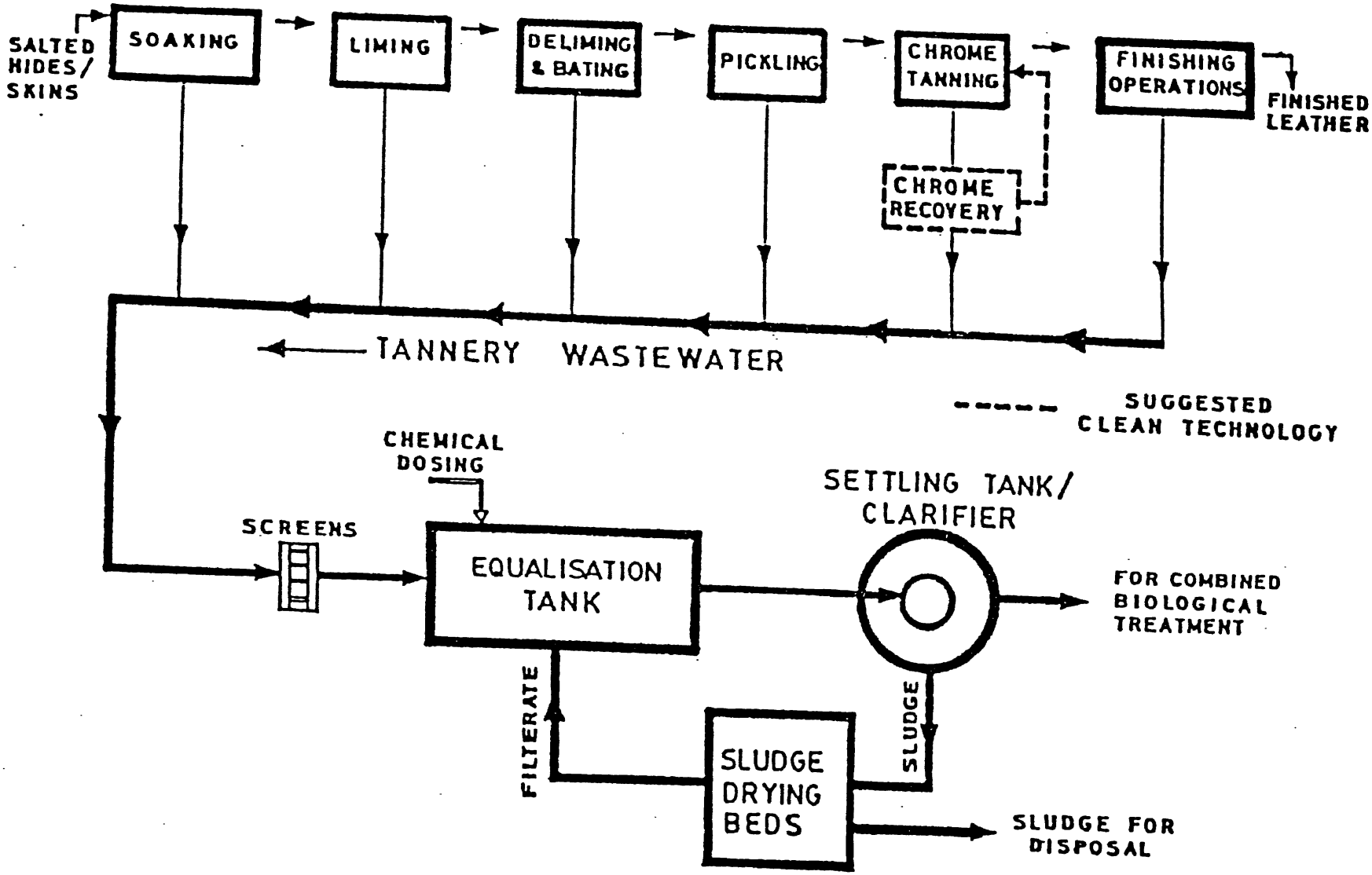


FIG 1. CHROME TANNING PROCESS & EFFLUENT TREATMENT SYSTEM

The characteristics of the waste chrome liquor and overall composite tannery wastewater are given in Table 1.

Table 1 Characteristics of Waste Chrome Liquor and Composite Tannery Wastewater (Average value per tonne of hides/skins processed)

Parameter	Chrome exhaust liquor	Composite tannery wastewater including chrome exhaust liquor
pH	3.2	8.6
BOD (Total) 5 days at 20°C	0.5	55.0
COD (Total)	2.5	135.0
Total solids	81.0	700.0
Dissolved solids	80.0	600.0
Suspended solids	1.0	100.0
Chloride (as Cl)	20.0	150.0
Sulphate (as SO4)	10.0	50.0
Sulphide (as S)	-	2.0
Chromium (as Cr)	4.0	4.5

Note: All values except pH are expressed in Kg.

The wastewater discharge from the chrome tanning operation including washing is only 2000-3000 litres whereas the total volume of water for processing hides/skins from raw to finishing operations is 30,000 to 35,000 litres per tonne of hides/skins. Hence, it is manageable to segregate the exhaust chrome liquor before mixing with the other streams within the tannery for the chrome recovery system as shown in Figure 1.

3. NEED FOR CHROME RECOVERY AND REUSE

Basically it is not difficult to remove chromium from the waste chrome tanning liquor, because it is present in trivalent form which is generally insoluble at a pH range between 6-12. Mixing the chromium containing liquor with liming liquor from the pretanning operations followed by proper pH control and settling, is sufficient to remove the chromium as shown in Figure 1. Also, during the biological treatment the residual

chromium will be precipitated and/or combined with the protein containing sludge in the system. The disposal of large volumes of chrome containing sludge, which can be estimated to be about 100,000 tonnes per year, will be a serious problem in case all tannery wastewater is treated in India. The value of the chromium salt wasted per annum is about 180 million Rupees (i.e about 10 million U.S. Dollars). Therefore, it was considered worthwhile to study the feasibility for recovering the chromium and to reuse it for tanning.

4. CHOICE OF CHROMIUM RECOVERY AND REUSE SYSTEM

In principle chrome recovery and reuse can be realised in three different ways.

- **The direct reuse method:** This implies that spent liquors are reused directly as much as possible as a tanning liquor for the next batch. Additional chromium is supplied to compensate the deficiency. The main constraint in adopting this method is that the salts and other impurities are accumulated due to repeated reuse and will have negative effects on the leather quality.

- **The indirect reuse method:** This implies that chromium is recovered by precipitation as hydroxide using alkali which is dissolved subsequently in sulphuric acid after which the solution can be used as a tanning liquor. The advantage of this method is a more efficient use of chromium and a cleaner reusable solution which normally does not affect the leather quality.

- **Separation of chromium compounds:** In principle by this method recovery of chromium can be achieved by separating the chromium compounds from other salts in the spent liquors. In this method the chrome liquor may be cleaner than by the direct reuse method, but this system requires rather sophisticated techniques such as electrodialysis, membrane separation, ion-exchange etc. and has limited scope for implementation in tanneries.

It was therefore considered to develop a simple type of chromium recovery and reuse system using a suitable alkali which is technically and economically feasible in Indian tanneries.

Basically all types of alkalies such as sodium hydroxide, sodium carbonate or bicarbonate, lime etc. are useful for chromium precipitation. Most of these alkalies are cheap. The highly reactive alkalies give a voluminous chromium sludge (i.e. more than 25% by volume) which makes it necessary to separate the sludge from the liquor by a

filterpress. Some alkalies like sodium hydroxide make it necessary to heat the liquor in order to obtain complete chromium precipitation.

The use of lime causes a simultaneous precipitation of chromium and calcium sulphate (plaster of Paris) which makes the reuse of the chromium problematic.

Finally, two systems were considered for chrome recovery. One with sodium alkalies which need the use of filter presses and the other with magnesium oxide (MgO) which, because of its low reactivity and solubility, cases the chromium to settle in a very compact way, so that separation from the liquor is merely a question of decantation of the supernatant. Dissolving of the sludge can be done instantly with sufficient sulphuric acid to obtain reusable liquor.

The use of the system with MgO as alkali is considered specially appropriate for small to medium sized tanneries, because of its relative simplicity and low investment costs. More than 90% of the tanneries in India are small or medium scale with processing capacity less than 10 tonnes per day. This system was chosen for the pilot plant studies.

5. PILOT PLANT FOR CHROMIUM RECOVERY AND REUSE

Principle of the Selected System

The process flow diagram of the chrome recovery pilot plant is shown in Figure 2. The chromium containing wastewater including wash water is screened and collected in a treatment tank. A calculated quantity of magnesium oxide is added to the liquor and stirred. During this stirring period the pH is gradually rises to the required value of about 8. After stabilization of the pH, stirring is stopped. The chromium precipitates and settles to a very compact sludge within an hour which is only about 8% by volume of the exhaust chrome liquor. The supernatant liquor is decanted.

The sludge is dissolved in sulfuric acid so that again basic chromium sulphate is formed which can be reused as tanning agent.

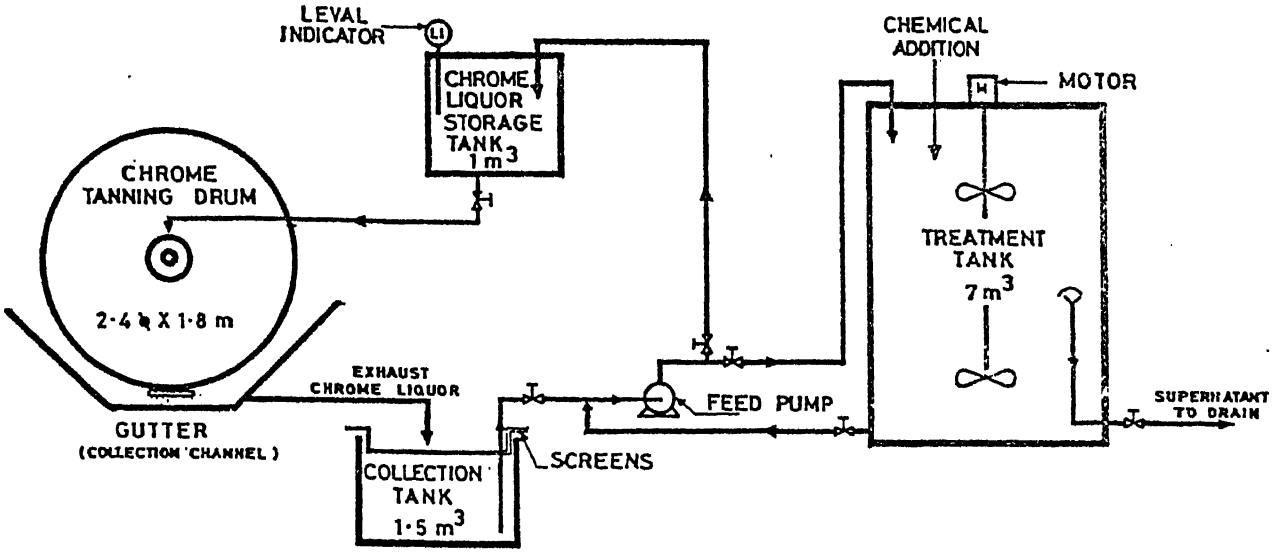


FIG 2.PILOT CHROME RECOVERY PLANT AT KANPUR , INDIA

The chemical reaction of the chrome recovery is

$$Cr_2(SO_4)_3 + 3\,MgO + 3\,H_2O \rightarrow 2\,Cr(OH)_3 + 3MgSO_4$$
$$2Cr(OH)_3 + 3H_2SO_4 \rightarrow Cr_2(SO_4)_3 + 6H_2O$$

The required quantities of Magnesium Oxide and sulphuric acid are estimated mainly based on pH measurements during the reaction.

Description of the Pilot Plant

The chrome recovery pilot plant was installed at Pioneer Tannery in Kanpur. This plant also serves as a demonstration plant for other tanneries in Kanpur. The capacity of the plant was designed to recover the chromium from the exhaust chrome liquor initially from one drum with a provision for further extension. The same drum was used for tanning

with recovered chromium. The capacity of the drum is 1000-1500 kg of pre- treated hides (pelt). The quantity of exhaust liquor including wash water was 3000-4000 L/lot.

In order to collect the chrome liquor separately from other liquors and also to avoid contamination by dirt from the floor, the drum has been provided with an outlet in the form of a round holes of 15 cm diameter. This hole was covered by an easily removable lid. Inside the drum a coarse screen was provided over the hole to prevent the hides from clogging the hole and to allow the liquor to pass through into the special collection gutter. The gutter collects exclusively the liquor flowing from the hole during as well as after drumming. In this way rinsing and washing is possible with an open hole. The gutter is connected to the collection pit by a pipe.

The exhaust chrome liquor contains small pieces of hide material (fleshings). In order to avoid accumulation of this material, the exhaust liquor needs to be screened before treatment. In the pilot plant a double screen has been placed on top of the collection pit. The volume of this pit is about 1500 L. After screening, the liquor is collected in the pit, from where it is pumped into the treatment tank.

The volume of the treatment tank is 7000 L. This is sufficient to allow the collection of the exhaust chrome liquor as well as washing liquors. The tank is made of steel lined with polyethylene. After the liquor is collected in the treatment tank the required quantity of MgO is added manually in the form of a slurry mixed with water. The liquor is then stirred well using a mechanical stirrer. After stirring, the chromium is allowed to settle as sludge and the supernatant is decanted. Valves are provided at different heights from the bottom of the tank for decantation of the supernatant. After decantation, the calculated quantity of sulphuric acid is added and after a short stirring the recovered liquor is pumped to a storage tank.

The storage tank has a volume of 1000 L. It is made up of PVC and is placed at such a level that addition of recovered chromium to the tanning drum is possible by gravity. The storage tank has been equipped with a level indicator, which can be read from outside the tank, to measure the quantity of liquor added to the drum. Addition of recovered chromium with the required fresh chromium takes place through a pipe ending in a funnel which is connected with a pipe to the hollow axle of the drum. The required fresh chromium salt (BCS) is added through the door in the usual way.

Operation of the plant

The operation of the plant as well as its monitoring aspects were carried by the consultants project team. In the first series of experiments the chromium of the exhausted

liquor of 41 lots, each of about 1000 kg of hides was recovered and reused during the study period. The plant was operated up to March 1990.

All the lots except the first six were tanned with about 70% fresh BCS and 30% recovered chromium.

6. EVALUATION OF THE RESULTS OF THE EXPERIMENTS

The chrome recovery pilot plant was operated and maintained well right from the start. The chromium content in wastewater ranges from 3000 - 5000 mg/L. The variation in chromium content is due to difference in the processing of the individual lots by the tannery. In view of this, regular analysis of the waste liquor is necessary to estimate the required quantity of MgO and sulphuric acid for the recovery process.

The choice of MgO as an alkali to precipitate chromium proved to be appropriate, because of the compactness of the chrome sludge and its easy separation from the liquor without a filter press. The precipitated chrome sludge volume is less than 10% of the waste chrome liquor and the supernatant liquor which is about 90% is decanted. Therefore, the major amount of dissolved solids are removed alongwith the decanted supernatant liquor as given in Table 2.

Table 2 Characteristics of the waste chrome liquor, precipitated, chrome sludge and decanted supernatant liquor.
(Average value per tonne of hides/skins processed)

Parameter	Waste chrome liquor from each lot	Precipitated chrome sludge using MgO	Decanted supernatant liquor
Volume in litres	1200	90	1110
pH	3.7	8.2	8.3
Chromium in kg	4.00	3.99	0.01
Dissolved solids in kg	80	6	74
Chloride in kg	20	1.5	18.5

The pilot plant studies revealed that continuous recycling without major variations in the quality of the recovered chromium is possible. It was also established that the procedure involving chromium recovery by precipitation ensures that considerable amounts of waste salts are removed alongwith the supernatant thereby improving the recovered chromium. After the study period the pioneer Tannery is making use of the chrome recovery pilot plant as a full scale chrome recovery and reuse plant for their entire tannery by making suitable modifications in the chrome exhaust liquor collection drains.

Quality of the Leather

After the initial experiments due attention was paid to the possible influences of recovered chromium on the quality of the leather. Initially the quality was assessed based on the colour content of the wet leather. Later on, the finished leather was also judged.

During the second series of experiments a more scientific quality comparison was carried out on the matched sides of 10 hides (a side is a half part of the hide). To that end 10 hides were cut into sides and marked. One side of each hide was tanned in the usual way and the matched sides were tanned with 30% recovered chromium and 70% fresh chromium. In order to obtain normal tanning conditions, the hides on which experiments were to be carried out, were mixed with whole lots. For both the lots all the important parameters were measured and analysed.

Organoleptic quality

In Table 3 different aspects of the organoleptic quality are given using a grading of 1 to 6, where 1 and 6 represent very bad and very good respectively. The figures in the table are average values.

Table 3 Organoleptic quality of leather from Normal tanning (N) and leather tanned with 70% fresh chromium and 30% of Recovered chromium (R)

	N	R	(N-R)
Tightness of grain	4.4	4.6	-0.2
Softness and fullness	4.4	4.6	-0.2
Tightness of bellies	4.4	4.4	-
Drawinness of grain	4.6	4.7	-0.1
Veininess	5.0	5.0	-
Evenness of colour	5.0	5.0	-

From Table 3 it appears that the leather tanned with recovered chromium has the same quality as the leather tanned with 100% fresh chromium. Some of the properties are even considered slightly better.

Physical Properties

In samples of the matched sides taken from comparable places the main physical properties namely thickness of the leather, tensile strength, tear strength and water penetration were tested. The testing was carried out in accordance with IUP (International Union Physical) and IS (Indian Standards).

From the test results, it has been observed that the differences between the two leather types are marginal and considered to be within tolerance limits.

Chemical Properties

Relevant chemical properties namely moisture, chromium, chlorides, sulphates and MgO contents of both types of leather in all the sides were tested.

From the chemical properties it appears that the differences between the two types of leather are small. The leather tanned with 70% fresh and 30% recovered chromium is remarkably similar in quality compared to leather tanned with fresh chromium. The main difference is the higher Mg content of the first which is according to expectations. However, the excess Mg content does not affect the quality of the leather.

7. COST BENEFIT ANALYSIS

Processing of the hides both before and after the main tanning operations remains the same in terms of processing time and method. As the quality of leather is not affected, the commercial value of the leather is not affected, the commercial value of the leather is not lower or higher than normal. Hence, the cost benefit analysis is restricted to the investment costs, operating costs of the chrome recovery systems and savings in costs of chemicals used.

For a medium scale tannery with a processing capacity of 5 tonnes per day, the capital investment for the chrome recovery system is about Rs. 3,00,000. By adopting the tanning procedure with 7-8% Basic Chromium Sulfate (BCS), if the production takes place during 250 days per year, the annual consumption of BCS will be 90 tonnes. If the wastage is 1/3 of the used chromium then about 30 tonnes per year of chromium can be recovered and reused which is equivalent to Rs. 5,40,000.

The cost benefit analysis of a chrome recovery and reuse system is given in Table 4. The calculations only cover the investment costs and operating costs. The costs of floor space and the buildings in which the plant will be installed are not taken into account since the space required for chrome recovery systems is very small and is generally available in most of the tanneries.

Table 4 Cost Benefit Analysis of Chromium Recovery and Reuse (Based on December 1990 rates)

Tannery processing capacity	1250 tonnes of hides/year
Use of chromium salt (BCS)	90 tonnes/year
Capital cost of the chrome recovery system	Rs. 3,00,000/-
Annual operating costs	**Cost in Rs.**
Maintenance	10,000
Labour	10,000
Chemicals	90,000
Electricity	5,000
Miscellaneous	10,000
Total annual operating cost	1,25,000
Financial costs	50,000
Depreciation	45,000
Total annual cost	2,30,000
Benefits	
Value of chromium recovered @ Rs. 18,000 per tonne for 30 tonnes	5,40,000
Total profit/year	3,10,000

Net profit per working day Rs.1,240

Note: One U.S. Dollar =18IndianRupees approximately.

From the cost benefit analysis it appears that the cost of recovered chromium i. about Rs. 7,700/tonne, whereas fresh chromium salt costs more than Rs. 18,000/tonne. Profits will be relatively higher if the production capacity increases. In a tannery with a processing capacity of 10 tonnes of hides per day the recovery cost of chromium will be about Rs. 5,000/tonne which is only 30% of the cost of fresh chromium salt. More over the pay back period of the whole chrome recovery plant will be less than one year.

8. CONCLUSIONS

The results of the pilot plant studies clearly indicate that the chrome recovery and reuse system can be easily adopted by the Indian tanneries. The recovery of chromium is profitable. It is also to be noted that the cost of fresh chromium salt is increasing every year and this will result in additional benefits. In addition to the direct financial benefits for the tanners, the chrome recovery technology also prevents the dispersement of chrome in the environment which makes it a clean technology. Based on the success of the pilot plant studies a number of tanneries in Kanpur have started implementing the chrome recovery system, which proves the point that chrome recovery and reuse is a cost effective measure under Indian conditions with benefits to the environment. As a part of the dissemination programme, the Indo-Dutch project in association with CLRI extending technical assistance for five full scale chrome recovery units in Jajmau. The first full scale chrome recovery plant is now under construction at Asia Tannery, Jajmau, Kanpur is expected to be commissioned in February 1991 and the chrome recovery units in four other tanneries will be implemented before the end of 1991. In addition to the techno-economic benefits the pilot plant investigations created an awareness among the tanners on the need for clean technologies, improvement of the working environment and quality consciousness, reduction in wastage of chemicals and subsequent effects on the productivity.

ACKNOWLEDGEMENT

Acknowledgement is made to the Government of India and the Govt of The Netherlands, especially the Ganga Project Directorate (GPD) and the Royal Netherlands Embassy in New Delhi and the Dutch Directorate General for International Co-operation (DGIS) DAL/ZZ.

Realization of this technology development would not have been possible without the enthusiasm of the whole Indo-Dutch project team. In this respect the contributions of Mr H. Pelckmans, TNO/ILS, The Netherlands and Mr J.A.W. Maas, Resident Engineer on behalf of Haskoning in Kanpur are highly appreciated, specially for their guidance in implementation and monitoring of the pilot plant studies as well as their continuous

interaction with the tanners. Mr. H.Draaijer, Monitoring Engineer of the project was involved in the day-to-day monitoring of the pilot plant. Mr Abdullah Khan, Project Co-director from Iramconsult has contributed to the extension of this technology to other tanneries especially its institutional aspects.

Dr G. Thyagarajan, Director, CLRI is instrumental for the active involvement of CLRI in the Indo-Dutch project under Ganga Action Plan. Under the co-ordination of Dr. K.V. Raghavan, Deputy Director, Mr S.N. Gupta and Scientists of CLRI at Kanpur and Madras closely monitored the pilot plant and carried out all laboratory analysis on the performance of the chrome recovery system and leather quality.

Reference

1. Report on Tannery Waste Management - Volume V Chrome Recovery and Reuse prepared by CLRI on behalf of Indo-Dutch project at Kanpur under Ganga Action Plan (1990).

2. Clean Technology in the Leather Industry - Chrome Recovery and Reuse. S. Rajamani, S.N. Gupta, R.B. Mitra, J.E. Schaapman and H. Pelckmans - Paper presented in Industrial Waste Symposium - American Water Pollution Control Federation Annual Conference, October 7-11, 1990 Washington, DC, USA.

3. Clean Environment and better productivity in Tanneries - Chrome Recovery and Reuse. S. Rajamani, J.E. Schaapman, Abdullah Shan and H. Pelckmans - National Seminor organised by National Productivity Council, New Delhi, November 1990.

Poster Session

A SULPHIDE FREE LIMING SYSTEM

K PARTHASARATHY, B RAMANAIAH, J K KHANNA, K B GUPTA
K S JAYARAMAN, MALATHI SRINIVASAN AND RATNA CHAKRABARTY
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTARCT

Mounting pressure to contain industrial pollution has resulted in the search for alternatives. CLRI has developed a pollution free, environment friendly, cost effective enzymatic unhairing process as an alternative for the lime - sulphide process. The process has been optimised for goat and sheep skins and demonstrated in commercial tanneries sucessfully. Trials are now being carried out on hides. The results are encouraging.

BUFFALO UPPER RESEMBLING COW GRAIN WITHOUT GROWTH MARKS AND WRINKLES

K PARATHASARATHY, Y MURALIMANOHAR, S RAMALINGAM, M SUBBA RAO
B RAMANAIAH, L MURUGAN, D H KAMAT AND K S JAYARAMAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

Heavy buffalo hide is generally used for making sole leather and industrial leather because of its stouter substance throughout the greater part of the hide. The inherent defects in buffalo hides are the pronounced growth marks and roughness of the grain due to nerve papillae entering the epidermis unlike cow hides. An attempt has been made to get a wrinkle free leather resembling cow grain without growth marks by effecting suitable modifications in the wet work and in the mechanical operations. Short liming was follwed to reduce the intensity of the growth marks. Heavy retannage with syntans, wattle extract, and incorporation of higher percentage of fat liquor to overcome the hardness imparted during subsequent paste drying and for effecting snuffing of the grain were adopted. Subsequent plating with fine hair cell during finishing was found to produce satisfactory leather.

ALTERNATIVE NON-ENZYMATIC SULPHIDE FREE UNHAIRING SYSTEM

P K SEHGAL, G RAMAMURTHY, K B GUPTA AND MAHENDRAKUMAR
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

A new non-enzymatic sulphide free unhairing system based on metallic salts has been evolved and tried on skins. The process of the present system is environmentally clean, resulting in excellent unhairing in a shorter time produing odourless clean pelts. The results obtained are comparable with lime-sulphide system in terms of duration and efficiency of unhairing. In this system of unhairing hairs come out from the roofs and collagen does not get affected. The method of application is also easy Further work is in progress.

BIOCIDES FOR CURING OF SKINS - ALTERNATIVES TO PENTACHLOROPHENOL (PCP)

M SIVAPARVATHI, MAHADESWARASWAMY, R RAMESH, S C NANDY & K V RAGHAVAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

Biocides are screened for curing goat skins in admixture with common salt and the factors like availability, cost and toxicity of the chemicals are considered for the replacement of PCP. Goat skins could be preserved well for three months in a good condition by curing them with 35% salt + 2.0% Boric acid; 35% salt + 0.05% Parachlorometacresol (PCMC); 35% salt + 1.0% ziram; 35% salt + 1.0% Thiram; 10% salt + 2.0% Boric acid + 0.1% PCPMC; 5% salt + 3.0% Boric acid + 0.1% PCMC. Biocides and salts are added on skin weight basis. Goat skins could be preserved for 4 to 6 months by curing them with 35% salt + 2.0% Boric acid + 0.05% PCMC. Leathers produced from cured skins are found to be comparable in quality and in physical properties to those obtained from conventional wet salted skins.

FUNGICIDES - ALTERNATIVE TO PENTACHLOPHENOL (PCP)

G SUSEELA RAJKUMAR & M SIVAPARVATHI
CENTRAL LEATHER RESEARCH INSTITUTE. ADYAR, MADRAS 600 020

ABSTRACT

The effectiveness of certain fungicides as alternative to PCP has been evaluated for their fungicidal property on leather. Busan-30L, Parachlorometacresol (PCMC), Orthophenyl phenol and Slimicide were able to prevent fungal growth on pickled pelt and chrome blue at 0.05 - 0.1% (W/V) concentration. Benzalkonium chloride was found to be effective at 0.2% concentration. The same chemicals need little higher concentration of 0.25% except Busan at 0.1% concentration to preserve the finished leather from fungal attack. Fumigating effect of certain chemicals to prevent fungal attack during storage and transport revealed that exposure of leather to formaldehyde for 1 week at 0.5 - 1.0% V/W concentration for 15 days exposure and at 0.5 - 1.0% for 1 month exposure to prevent fungal attack. PCMC and orthophenyl phenol were effective at 2.0% concentration to prevent fungal growth when the leather samples were exposed for 1 month. B-naphthol, Dichlorometaxylenol, Dichlorobenzene and Trichlorophenol were ineffective even at 2.0% concentration.

A NEW COMBINATION TANNAGE FOR UPPER LEATHERS

S KULASEKARAN AND B N DAS
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

Following the adoption of direct vulcanization (DVP) Direct Injection Moulding (DIM) and DVIP, a hybrid of the two, need for thermally resistant upper leather has increased. Melamine which has been successfully used to modify casein has been tried for improving leathers for uppers. Melamine sole tannage, Melamine + myrob, Melamine + wattle, Melamine + Aluminium, Melamine + Zirconium, Melamine + titanium, combination tannages were tried and the leathers were tested for their physical chemical properties and compared with conventional chrome leathers. The decreasing order of desirable characteristics of these leathers is: Melamine-Zr-formaldehyde Melamine-wattle-aluminium, melamine-wattle, melamine alone. The advantages of the best combination namely melamine-zirconium formalyhyde combination are High thermal resistence, no pollution filler tannage suitable for lasting, high cutting value, tighter and smoother grain, softer feel, high water resistance and yet satisfactory water vapour permeability.

FANCY SPLIT FINISHING

C MURALIDHARAN, R RAMESH, T RANGASAMY, S RAMALINGAM
N C KRISHNAN AND J K KHANNA
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

With a view to enhance the aesthetic value of split leather and to utilise them in a better way for various end uses, different finishing techniques have been developed. In order to overcome the normal problems associated with split processing like bushy nap, discontinuity of finish film, hardening of the split due to sinking of finishing materials etc. suitable modifications have been carried out during processing and finishing. The various finishing techniques developed are as follows:

i) Denim Jeans effect
ii) Crack finish
iii) Two-tone finish

Because of these special effects, the cutting value of the leathers increase considerably. These effects can be carried out in tanneries easily with excellent reproducibility.

UPPER LEATHERS FROM SPLITS

C MURALIDHARAN, R RAMESH, T RANGASAMY, S RAMALINGAM AND K S JAYARAMAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

In order to augment the shortfall in supply of raw materials and to enhance the unit value realisation on the hides, attempts are being made world over to produce upper leathers from splits. The major drawbacks posed by splits in such an endeavour are poor strength chracteristics and opening up of the finish on double folding when conventional finishing system is adopted. In the present work, by suitable modifications in unit operations, strength characteristics of split leather has been improved considerably to meet the requirements of conventional upper leathers. By the use of a cheap protein based filler in finishing, the difficulties normally encountered in splits finishing have been overcome. Field trials have been carried out and results are satisfactory.

SPECIAL EFFECTS IN DYEING

C.MURALIDHARAN, T.RANGASAMI, R.JAGADEESWARAN, R.VENKATACHALAPATHY AND K.S.JAYARAMAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

A new technique to produce special effects in dyeing has been developed using hydraulic press and by roller coating machine. The effect obtained by this technique is similar to that produced by "Dorn bush" machine. The principle behind this technique is to effect a preferential uptake of dye in specific places so as to get the design of the print embossed on the leather in two-tone. The methodology is to print the crust (dyed/undyed) leather and pass through the roller coating machine, applying a specific auxiliary. The leathers on subsequent dyeing in drum with contrast colour produce the two- tone effect. Such an effect can be obtained on all types of leathers including suedes. The salient features of this technique are uniformity of design obtained in the whole pack of hides/skins and reproducibility of the design, without the raised effects normally obtained during embossing.

ENDLESS SEARCH FOR ALTERNATIVE FINISHING TECHNIQUE SEAL SINK FINISH

B SRIDHARNATH, J K KHANNA, K S JAYARAMAN, K V RAGHAVAN AND G THYAGARAJAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

Newer finishing techniques using machines such as roller coating and Dornbush are now increasingly employed to get special effects. With a view to developing a suitable finishing technique without use of sophisticated machinery and speciality chemicals, a simple and cost effective finishing technique called "Seal & Sink" finishing technique has been developed. This can be easily adopted by all types of tanners, including in the small scale sector as well as in rural sector. With this technique, all types of leathers from different raw materials can be finished with an exotic look eliminating the need for special machinery or finishing auxiliaries. This technique can also be used to produce a different print effect by employing modern machinery. This technique is able to upgrade the lower ends to a marked extent.

Process flow diagram:

Chrome/Semi-chrome/E I crust
|
Seal the surface with CLRI Paste
|
Dry
|
Apply the finish
|
Fix with Resin/Casein/Wax

This know-how is available for sale from CLRI.

PEARLESCENT LEATHER FINISH

S BALAKRISHNAN AND C MURALIDHARAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

A pearlescent effect is obtained when light is refleted from a structure consisting of many layers. Each layer should be transparent so that only a portion of light is reflected, the reminder passing through to be refleted by layers underneath. A practical method of building up of peazrlescent finish using a good pearlescent pigment formulation using titanium dioxide and mica is described. This method is suitable for obtaining a coloured or tinted pearlescent finish as well. These aqueous finishes are found to be non-toxic and stable to heat, light, sulphide fumes and other similar corrosive chemicals.

LIMITATIONS AND SCOPE OF COLOUR MANAGEMENT TOOLS IN LEATHER INDUSTRY

R.VENKATACHALAPATHY, T.RANGASAMY, K.PARTHASARATHY
K.S.JAYARAMAN AND K.V.RAGHAVAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

Experienced human eye without colour blindness is the nessary tool in leather coloring. But tristimulus colorimeter with microprocessors and spectrophotometers interfaced with computers to specify and define object colour and colour differences based on CIE 1931 standard observer were used in the experiments of leather colour matching and assessment of colour attributes of brightness, chroma and saturation of the finished leathers both for clothing and shoe uppers. Colour matchings were based on the linear relationship between absorption coefficients of leather surface colour and the concentration of non fluorescent leather colorants used in leather coloring. Visual perception along with measurement of colour and colour differences between standard customer's sample and experimental swatches proved to be successful with the hardwares and CIE LAB colour difference values derived from reflectance data for decision making of the quality and quantity of colorants for coloring rapidly and objectively.

PROCESS LIQUOR COLLECTOR AND pH MONITOR

D LAKSHMANAN, R JAGADEESWARAN, C MURALIDHARAN, H PURUSHOTHAM AND K V RAGHAVAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

A new device for collecting the sample liquors for monitoring the pH of the liquors, checking the uptake (exhaustion) of various chemicals and for addition of chemicals during processing of leathers in a drum. This simple device can easily be fixed to any existing drum without calling for any modifications in the size, shape or capacity of the drum. This system, consists of a set of taps for letting out the liquor in to the collector and the tank in which pH & temparature can be measured to put the liquor back to the drum. This device offers a scope for automation of the leather processing in drum, apart from reducing the drudgery on labour and saving in processing time.

THERMOCHEMICAL REACTIONS OF CHROMIC HYDROXIDE AND THEIR RELEVANCE TO CHROME SLUDGE UTILIZATION

B G S PRASAD AND B U NAIR
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

The management of chromium(III) sludge resulting from physicochemical treatment of tannery waste water has remained a serious technological problem. The disposal of chromium (III) sludge into land has caused concern and there exists a belief that chromium (III) salts may well undergo oxidation to chromium (VI) forms under the actions of soil bacteria. One of the commonest methods of utilisation being probed in the management of Cr(III) sludge is in potential manufacture of bricks. In this investigation the thermochemical behaviour of Cr(III) hydroxide has been examined with a view to assess the potential danger of the formation of toxic forms of chromium (VI) on one hand and the conversion of chromic hydroxide into non-leachable forms of Cr(III) oxides on the other.

Experiments have now been carried out on chromic hydroxide samples prepared in the laboratory to investigate the possible oxidation of chromium (III) to chromium (VI) under pyrolitic conditions. Known amounts of samples of chromic hydroxide have been heated at 200, 600 or 900°C for varying periods ranging from 1 to 30 hrs. The heating has been carried out both in the presence of air and in sealed tubes (to minimize oxygen content) and the amounts of chromium (VI) and chromium sesquioxide formed have been estimated. The thermogravimetric and differential thermal analysis have been carried out. It has been observed that significant quantitities of soluble chromium (VI) complexes are formed when heated to temperatures exceeding 200°C in air although exclusion of oxygen seems to minimize the amount of chromium (VI) formed. It is observed that the phase transitions of chromium (III) oxides leading to the formation of insoluble sesqui oxide are higher when heated at 600°C for 10 hrs. These observations give valuable clues to the safer utilization of chrome sludge from physicochemical treatment of tannery waste water.

'CLARIBLEACH' - A COLLAGEN BASED HAIR BLEACH

M D RANGANAYAKI
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

"Claribleach" - a hair bleach based on collagen was prepared from collagen rich raw stock and evaluated. "claribleach" is a product which effectively bleaches the black human hair of Indian origin to various shades without resorting to dyeing. Due to the presence of this ingredient, even under drastic bleaching conditions, the hair does not lose softness, smoothness or lustre and above all it imparts substantivity which is a unique property of this product.

pH DEPENDENCE OF C-13 NMR CHEMICAL SHIFTS OF PENTACHLOROPHENOL

HARISH KUMAR SINGH
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

The change of C-13 NMR chemical shifts of Pentachlorophenol (PCP) have been observed at different PH values ranging from 2 to 10. Hydrochloric acid and Sodium Hydroxide solution have been used to change the PH of the solution of PCP in acetone. An appreciable change of C-13 chemical shift has been observed for the Phenolic carbon. However, no appreciable changes in C-13 NMR chemical shift has been observed for the carbons corresponding to ortho and meta positions of PCP. It is proposed that this observation can be used in quantitative estimation of PCP in the discussed pH ranges.

A NEW APPROACH TO OBJECTIVE ASSESSMENT OF LEATHER

S ANANTHANARAYANAN, V ARUMUGAM AND T RAMASAMI
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

A new approach is made to use non-destructive technique in leather for the evaluation of its physical properties. The method uses the ultrasonic velocity and attenuation studies through leather samples. The elastic constants on various locations and layers of leathers were studied. This also includes a study of defects and non-defects. The results establish the validity of the technique within a range of 1-2% of the experimental error. The technique has a potential application in situ grading and imaging of defects.

CONTINUOUS PROCESS CONCEPTS IN LEATHER MANUFACTURE

H.PURUSHOTHAM AND K.V.RAGHAVAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

Leather industry has realised the impact of the technological advancement and progress of electronics in various sectors of industry and expressed the need for processes which would reduce processing time, manual labour, ensure safer working conditions, increased productivity, reduced solid and liquid wastes, and savings in process chemicals and energy. In response to industry requirement and realising the need of the hour, many R & D institutions and leather manufacturers jointly worked and developed a wide range of continuous mode or through feed technologies applied on increasing number of unit operations and processes to dispense with the batch processing of leather.

An attempt is made in this paper to review such technologies and examine their suitability to the Indian conditions. Concepts such as semi-continuous, continuous modes of production as practised in chemical industry are examined for their relevance with the help of product life cycle concept and break even point analysis. The life cycle concept or womb to tomb concept draws analogy from living organism. It assumes that every system (product) has a definite life cycle and it passes through introduction, growth, maturity, saturation and decline phases. Analysis of volume of production of leather in India vis-a-vis product life cycle concept, break even point analysis and process forms such as batch, semi continuous and continuous process for manufacture of leather, strongly suggests that Indian leather industry should adopt a semi-continuous/continuous process concepts at the earliest as its strategy for survival, growth and to become a leader in the international market.

Keeping in view the above need, developments in semi- continuous and continuous technologies in pre-tanning and post- tanning operations are briefly discussed.

NEW TECHNOLOGY FOR THE DESIGN AND FABRICATION OF METAL SHANKS

T N SENTHILVELAN, GAUTAM GOPALAKRISHNA,
D L V RAO, AND K V RAGHAVAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTARCT

There is a growing demand for the indigenization of footwear components manufacture. No specific standards are available for all components and the existing ones are not adequate. There is no established design and fabrication strategy for shanks and other cmponents based on sound scientific and engineering principles. Metal shanks espcially require engineering design based on its functional adaptations in high heeled shoes.

This paper attempts at an application of the fundamental principles of engineering mechanics to shanks which has resulted in accurate dimensions for optimum working conditions. A design strategy for shanks has been suggested. Material selection and the fabrication strategy for arriving at the optimum properties for shanks have also been outlined. The flexural rigidity of shanks vis-a-vis its hardness, grain direction and method of heat treatment and its influence on the stiffness value have also been exhaustively studied. The cost efficacy of double fluted shanks have also been worked out in detail. Corroboration with available test reports indicate good concurrence.

ELECTRO-PNEUMATIC TESTING INSTRUMENT FOR ZIP FASTNER FATIGUE AND SHOE LACE ABRASION

K GNANA PRABHU, P PADMANABHA RAO AND B VENKATAPPAIAH
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

An electro pneumatic instrument has been developed to test zip fastners used in footwear, leather goods and apparel industry. Mechanisms of the instrument has been explained with diagram. This same instrument could be used to test resistance to abrasion of shoe lace.

ANTI-STATIC AND ELECTRICALLY CONDUCTING SAFETY FOOTWEAR

SATYABRATA CHANDA, S ANANTHANARAYANAN AND B VENKATAPPAIAH
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

Safety footwear intended for personnel working in an atmosphere of elctrostatic build up or with portable electric equipment has been developed. Electrical properties of various shoe uppers and bottoms have been studied and described.

LASTOMETER STRENGTH CONTOURS OF GLAZED GOAT UPPER LEATHER: A CLUE TO LEATHER CHOICE FOR FOOTWEAR COMPONENTS

B SIVARAMAKRISHNAN AND B LOKANADAM
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

The lastometer test has been performed on glazed kid goat upper leather samples taken from different locations in a systematic manner. The conditions of shoe lasting was simulated in the lastometer test and the grain crack resistance, bursting strength and distension were measured. The values of physical strength data obtained were illustrated coherently in the form of three-dimensional strength profile model. The results indicated that it is possible to cut toe and vamp components not only from the official butt region, but also in and around the butt region without having any siginificant increase in the failure rate of toe and vamps both at the component and assembly levels. This study provides evidence that the cutting value of any particular leather obtained from a given manufacturing lot can be enhanced by judicious choice of orientation and component testing.

TANNING CAPACITY IN DEVELOPED AND DEVELOPING COUNTRIES

R.RAJENDRAN AND S.CHELLAPPA
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

The intensive growth of industrial development activities in developing countries has prompted the changes in the pattern of growth in leather industries also. In the past 30 years, the structure of world's hides and skins resources, leather production and extent of utilisation of leather have changed more radically than during any other period in the history of the leather industry. Major changes have taken place in two phases i.e. before and after 1975, when there was a higher rate of slaughter in USA and the massive production of footwear in countries like South Korea and Brazil. This trend which had threatened the U.S. markets, gained momentum rather before than after 1971-72, when a developing country like Argentina banned the exports of hides to build up and to strengthen her own tanning and finishing industry. This gave the lead to many other supplier-countries to follow suit.

From the available data, one can see two types of themes floating in the world leather circle. One is on the transfer of tanning and production capacity from developed countries to developing countries and the second one is relocation of tanning and production capacity within the developed country itself. To substantiate the said two views, supportive evidences are produced.

CHANGING GLOBAL SCENARIO AND INDIAN LEATHER INDUSTRY

K SARJUNA RAO
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

In the annals of history, both politically and economically the 20th Century will be remembered as one of the most turbulant one. While the western European countries are coming closer under the banner of enlarged European Economic Community (EEC), the Eastern block is gradually getting disintegrated. These developments are bound to have their own repercussions.

By 1992 one of the most important economic development likely to take place will be the economic integration of twelve countries. As EEC is one of the important trading partners of India, this development is bound to have its own impact on the exports prospects of India's leather and allied products.

The disintegration of East European countries and their attempt to enter market economy from centrally planned economy will also have its impact on the leather trade of India.

Likewise the Asian countries also should group themselves into a block. Though it is a time consuming process, it can be initiated in right earnest. Asian organisation like ASEAN, ESCAP, SAARC, NAM etc. have the potentialities to organise the Asian economic block.

In the changed circumstances, India with its strong raw material base, cheap labour and fairly well developed industrial basis in an advantageous position. However, it has to take some corrective measures to put the industry on the right track. For this a close dialogue among the cross section of trade, industry. policy makers is necessary.

EFFECT OF UREA ON THE THERMOMECHANICAL PROPERTIES OF COLLAGEN

USHA RAMAMURTHY AND T RAMASAMI
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

The thermomechanical stability of a collagenous matrix is generally attributed to the presence of inter- and intramolecular crosslinks in the protein. Such discussions often do not take into account the role of solvents and hydrogen bonded interactions on the matrix stability of collagenous tissues. However, the denaturation of native collagen in 10M urea is already known and this is attributed to the hydrogen bond breaking ability of urea and changes in the conformation of the protein under such environmental conditions.

In this investigation, an attempt has been made to study the effect of urea on the thermomechanical properties of collagen such as shrinkage temperature and isometric tension, stress- strain characteristics and the stress relaxation properties. The energies of activation are calculated using non-linear least square fit. These properties are studied under the influence of 1M, 3M and 6M urea solutions and a compelling evidence for the importance of secondary structures resulting from hydrogen bonding on the matrix stability of collagen has been presented.

EPIDERMAL CELL CULTURE-A BEGINING TOWARDS THE SYNTHESIS OF ARTIFICIAL SKIN

MARY BABU AND V PRATHIBA
CENTRAL LEATHER REESRACH INSTITUTE, ADYAR, MADRAS 600 020
AND
K RAMACHANDRAN, V JAYARAMAN AND K MATHANGI RAMAKRISHNAN
DEPARTMENT OF BURNS, PLASTIC AND RECONSTRUCTIVE SURGERY
KILPAUK MEDICAL COLLEGE HOSPITAL, MADRAS 600 010

ABSTRACT

In a burn injury, prevention of bacterial infection and sepsis is challenging problem to the plastic surgeons. To accomplish this a wide variety of burn dressings, both biological and synthetic are in practice in developed countries. In a developing country like India, no suitable dressing is widely used. This may be due to the problems involved in the preparation of these dressings in bulk quantity at an economically viable rate. An attempt has been made on the culture of epithelial cells from human skin to look for its potential as a skin substitute in the form of autograft or allograft.

Epithelial cells were cultured from human skin samples obtained during surgery. The skin pieces transported to the tissue culture laboratory were washed and trypsinised. THe epithelial cell suspension was prepared and cells were grown under suitable conditions. After the cells reached confluency, they were subcultured and allowed to grow to a thickness of 4-6 layers. This cultured epithelial would be tried out as a burn cover in a few patients.

ONLINE INFORMATION SEARCH SERVICES FOR SCIENCE AND TECHNOLOGY

S SUBBA RAO AND P SURESH
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

Most scientists are aware of the enormous increase in the scientific and technical literature which approximatly doubles every 10-15 years. To keep abreast of the expanding literature in science and technology is virtually a full time job. But such full time pursuit of source literature becomes impossible with other commitments. The source literature over the past 300 years has been increasing exponentially at the rate of 6-7% a year and in terms of number of journals about 1000 seventy years ago to well over 20,000 today. This encourging recourse of secondary sources such as abstracting and indexing journals. Another approach- increasingly used since its faltering introduction in the 1970's involves online searching of computerised databases. These are available in different forms viz. bibliographic, full- text, numeric and directory type containing millions of records. CA SEARCH, BIOSIS PREVIEWS, INSPEC, MEDLINE etc., are few examples.

Online searching is a means of obtaining required information, either bibliographic or numeric by using a computer in an interactive mode. It is intiated by telephoning remote 'host' computers on which the databases are stored. The essential equipment includes a microcomputer, a modem, a telephone line, a printer and communication software.

The path of information flow is given below:

Database<--> Publishers	**Databases <-->**	**Online <--> Services**	**Tele-<--> comm. Networks**	**Users**

The advantages of online information searching is to keep abreast of current information, satisfies multidisciplinary approach, overcomes langauge barrier to a certain extent, overcomes non-availablity of information sources in the printed form locally. The major advantages are less time consuming and more cost-effective when compared to manual searching and also the comprehensive coverage of the subject of interest.

To encourage the information usage, DST, New Delhi, has come forward to set up five regional centres to access international databases under its NACID project of which CLRI, Madras is one such centre catering to the information needs of the users of Tamilnadu, Kerala, Pondicherry, Lakshadweeps and Andaman and Nicobar Islands.

HAZARDS OF TANNERY CHEMICALS

L RANGACHARI, M M MALLIKARJUNAN AND K V RAGHAVAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

The potential hazards associated with various stages of leather processing are identified. Chemical hazards are generally associated with fire, explosion, toxic and corrosive effects. They have accordingly been classified as flammable, reactive and toxic and the hazard potential is quantified with the help of NFPA ratings. Material Safety Data Sheets for all the critical chemicals listed in this paper are available at the Cell for Industrial Safety and Risk Analysis (CISRA) for information dissemination.

FISH SKIN COLLAGEN AS A SUBSTRATUM IN CELL CULTURE

D NAGAMALLESWARI, MARY BABU, R ASOKAN AND K THOMAS JOSEPH
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

Collagens in general are emerging as a good structural support for cell culture by virtue of their ability to bind cells. Rat skin collagen has already been examined for its usefulness as a support for cell culture. It is of interest to make a relative assessment of fish skin collagen from Scomberoides commersonianus as a substrate for supporting cell culture. The fish skin collagen was purified and it exhibits a close similarity to type I collagen in higher vertebrates.

Rat embryo fibroblasts were cultured on fish skin collagen substrate showed significant proliferation and compares well with rat skin collagen substrate. The experimental methods and results are discussed with respect to its potential in culture system.

PRELIMINARY STUDIES ON A SPECIES OF STREPTOMYCES EXPRESSING A PROTEASE

PADMAVATHI SAMPATH AND GOWRI CHANDRAKASAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

ABSTRACT

Actinomycetes and non-pathogenic gram-positive bacteria that exhibit true branching. Actinomycetes particularly Streptomyces are a good source of proteolytic enzymes and those studies so far include S.griseus, S.fradiae, S.rimosus, S.aureofaciens and S.moderatus.

In this study, we report the isolation and some preliminary characteristics of a species of Streptomyces obtained from the tannery soil, expressing an extracellular protease. The cultural and physiological characteristics of the species were studied which indicated that the organism belongs to the genus Streptomyces. Examination of the organism under the scanning electron microscope revealed the presence of intact chain of spores and a smooth surface of the spores.

The ability of the organism to express an extracellular protease was studied using different cultural medium. The optimum conditions for its expression was found to be in a media supplemented by soybean meal and mannitol at 28°C and at a pH of 7.2. The enzyme was obtained from the culture filtrate by salt fractionation (using Ammonium sulphate at 80% saturation) and centrifugation. The enzyme thus obtained was dialysed against a buffer of tris-HCl (pH 7.2 and purified on a DEAE-cellulose column. On SDS-PAGE analysis, two distinct bands were obtained suggesting the heterogenous nature of the enzyme. Further studies are being carried out on the applicability of this enzyme in the beamhouse operations.

ESTIMATION OF SELENIUM IN BIOLOGICAL SAMPLES

N RAJENDRAN, K PANDIAN AND S SRIMAN NARAYANAN
DEPARTMENT OF ANALYTICAL CHEMISTRY
UNIVERSITY OF MADRAS
GUINDY CAMPUS, MADRAS 600 025

ABSTRACT

Selenium is considered as an essential micronutrient for plants and animals. Chemical evidences indicate that selenium is mostly present in the organic form. Insufficient amounts of selenium produce diseases such as exudative diathesis, liver necrosis, white muscle sclerosis and cystic filorisis. Because of the importance of selenium, more and more efforts are being made to devise sensitive and selective analytical methods for the determination of selenium in selenoproteins and selenoamino acids. A simple polarographic method has been developed for the determination of selenium in biological samples. In this method, the selenium in biological samples is digested by acid decomposition method to convert selenium to Se(IV). The Se(IV) is then treated with excess of thioglycolic acid in alkaline medium and subjected to polarographic analysis. The wave with an half wave potential of 1.01-1.04 V (vs SCE) corresponds to Se(O)-TGA complex, which is directly proportional to the amount of Se(IV) present. This method is applicable for the determination of selenium in 5 to 50 g range in biological samples.

PROJECTING THE INDIAN LEATHER INDUSTRY TO THE WORLD

V SAMBASIVA RAO
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR,MADRAS 600 020

ABSTRACT

The position of an industry for its potential contribution to the economy is indicated by its position among items exported from the country, foreign exchange, employment, and its growth in domestic sector. Leather Industry exports Rs. 2030 Crores during 1989-90 witnessed rapid changes. The export targets set for the industry by the Government have beeen achieved. Recently, the Indian Government has taken a decision to ban on the semi-finished and finished leathers. This would necessarily increase the export of value added products.

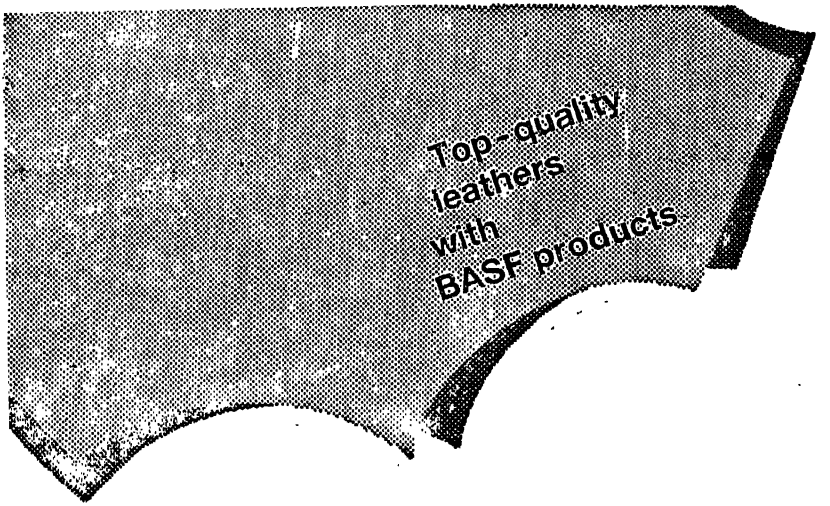
The above ban order offers an opportunity to the Indian leather exporters to increase their exports by resorting to export promotional measures. The export measures for projecting the Indian Leather Industry such as (1) sending more leather trade delegations, and taking part in international fairs, and exhibitions, (2) propagating through promotional activities such as publicity abroad, organising the buyer-seller bilateral meets in India,etc. Government of India, CLE and trade organizations should (i) provide information about export opportunities and conducting research programmes for market study, for finding out better and newer uses of the commodities (ii) Open offices in foreign countries where such offices do not exsis so far for helping exporters in consolidating the exports and diversifying the new products, and (iii) effectively liaise with industry and trade in order to identify the problems faced by them in their export activities and providing expert state-of-art training facilities in foreign countries for our technicians and engineers and managers.

WITH BEST COMPLIMENTS FROM:

K.H. GROUP OF COMPANIES

NO. 2, HUNTERS ROAD
MADRAS : 600 112
I N D I A

PHONE : 38531 (3 LINES)
TELEX : 041-7367 MAKH IN
041-6236 LEA IN
TELEFAX : 91-44-30185



The BASF range for the leather industry offers you high-quality products for all stages of processing – perfectly adapted, reliable and economical.

This range will help you to produce the right leathers for your market, – and also to achieve the best cost-benefit ratio, and to fulfil all new statutory requirements.

The BASF range for all stages of production

Beamhouse
Amollan® · Picaltal®

Tannage/Retannage
Basyntan® · Chromitan® · Relugan® Implenal® · Neutrigan® Tamol®

Dyeing
Eukesolar® dyes Luganil® dyes

Fat-liquoring
Lipamin® Liquors · Lipoderm® Liquors

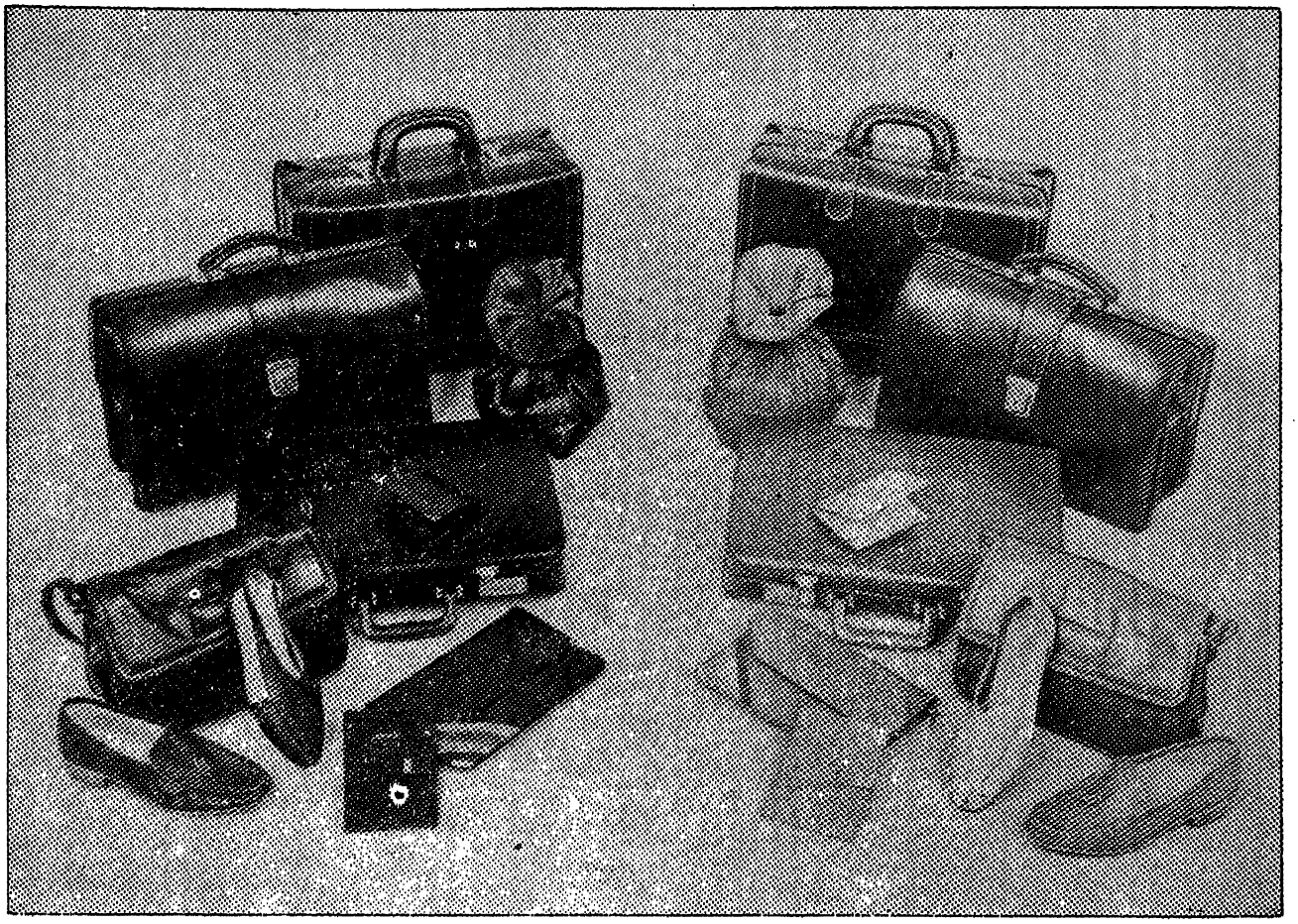
Finishing
Corial® Binders · Corial EM Finish · Corial Mat Lacquers · Corial Waxes · Eukesol® · Lepton® Binders · Lepton colours · Lepton Lustre · Luron® Binders

Call us for further information about our products and our service.

BASF products for economy and quality

BASF India Limited
Maybaker House
Sudam Kalu Ahire Marg
Bombay-400 025
Phone: 493 0703

BASF



Black is beautiful.

Atul, makers of the widely known Leather Black DE Hly Conc – are trusted the world over for their superior finish and performance. Atul Leather Black DE Hly Conc is a testimony to Atul's expertise and superior R&D, presenting an incomparable product in the service of the Leather Industry.

So is brown, yellow, red and blue.

You can confidently order from Atul all the colours and shades of leather dyes you require. They conform to colour index generic names and constitution numbers. They are compatible with all types of tanning systems as well as all varieties of leather.

We offer Azo class dyes as well as dyes belonging to other groups – Acid, acid milling, 1:1 metal complex (export only), 1:2 metal complex, 1:2 metal complex dyes with ionic solubilising group, direct, light fast direct, basic and mordant.

For detailed information and technical service contact: Marketing Department.

THE ATUL® PRODUCTS LTD.

Atul 396 020, Gujarat, India. Telex 0173 232 ATUL IN.
Phone: ATUL 61 to 65. Telegram: TULA. ATUL.

UP TO DATE

LEATHER AUXILLIARIES MARKETING CO. PVT. LTD.

2A, Gulam Tilani Khan Road, Calcutta : 700 039

Phone : 29-6476/29-1853 ; Cable : SACSDAMES

Telex : 21 7894 SACS IN

With best compliments from:

INTERNATIONAL EXPORT CORPORATION

10, PEMENTAL STREET

CALCUTTA : 700 016

MANUFACTURER/EXPORTERS OF LEATHER, LADIES HAND BAGS AND ACCESSORIES.

BEST EXPORT PERFORMANCE AWARD WINNER FOR FIVE YEARS FOR HIGHEST EXPORTS TO GCA COUNTRIES.

PHONE : (033) 29-5583, 29-1602

TELEX : 021 4422 IGT IN, 021 5263 IEPL IN

Fax : 91-33-291596 IGT

Cable : "BENZYTRADE"

IF IT'S FROM BAWA

IT IS MADE TO LAST

WITH COMPLIMENTS

FROM

BAWA SKIN COMPANY,

An Associates of:

B BAWA GROUP OF COMPANIES
A PO: RAMDASPURA,
W JALANDHAR-144003/INDIA
A

Phones : 73028, 74128, 79449
Telex : 0385 231 BAWA IN
Fax : 00 91 181 76942

Manufacturers & Exporters of Leather Shoe Uppers, Leather Shoes, Finished Leather, Industrial Hand gloves & Leather Garments.

Associates

1. BAWA SKIN COMPANY - Govt. Recognised Export House
2. SARUP TANNERIES LIMITED - Govt. Recognised Export House.
3. BAWA SHOES LIMITED - Govt. Recognised Export House
4. BAWA LEATHER INDUSTRY
5. SARUP INTERNATIONAL
6. ANU LEATHER

BURNISHED BUFF CALF

FASHIONABLE LEATHERS

INDUSTRIAL SAFETY BOOT LEATHERS

OIL PULL UPS

NU BUCK

WATER PROOF LEATHERS

GARMENT NAPPA

SHOE AND BOOT UPPERS

ORIGINS:

COW, BUFFALO, BUFF CALF

Super Tannery (India) Limited

(A Govt. Recognised Export House)

Regd. & Head Office:

JAJMAU ROAD, KANPUR - 208 001

(INDIA)

Phones : 41450, 42122, -37-38

Telex : 325-291 SUPR IN
325-260 SUPR IN

Cable : 'SUPER' KANPUR

Fax : 91 - 512 - 211107

Bank : State Bank of India, International Banking Division,
Kanpur Main Branch.

SOCCER TANNERIES PVT LIMITED

Tanners, Finishers & Exporters

Specialised in:

* Full Chrome cow softy Upper, upholstery and Lining
* Full Chrome Sheep Clothing Nappa & Swede
* Full Chrome Buff Aniline & Semi Aniline Upper and Upholstery Leather
* Leather Garments

Head Office :

Basti Sheikh Road
Jalandhar : 144 002

Phone : 74562
Cable : INTERSOC Jalandhar
Telex : 385-247 SOCR IN
Fax : 0091-181-74815

Tannery :

Jallowal Abadi
Behind Model House,
Jalandhar : 144 003.

Phone : 76437, 74562
Cable : INTERSOC

A DIVISION OF SOCCER INTERNATIONAL

Branch Office:

B-285, Okhla Industrial Area
Phase-I
New Delhi : 110 020

Phone : 6839775

Malaysia, Thailand, P.R.China and Philippines where wage levels are relatively low and pollution regulations are not severe. Japan has invested heavily in Indonesia to tap its relatively cheap labour, hides and skins. Today, Indonesia has stopped the exports of raw and wet blue hides and skins in favour of high value added leathers and products. Further it has started processing imported raw materials from New Zealand and Australia; India has not ventured its capital investment in other countries of Asia.

6. South Korea and Taiwan made tremendous progress in the fabrication and export of machines for tanning, footwear and leather goods. They offer at prices much lower than those of the products of the West (upto 20% down compared to Italian prices) without loosing technological efficiency. This field has been neglected in India.

7. To cater to the sophisticated markets of industrialised countries the production of high priced fashion products is being stepped up. The market for the low priced products has been released to lower wage countries. India has yet to reach this progress.

8. South Korea looks forward to collaborative ventures and tie-ups to set up new production units in low wage countries of Asia.

9. P.R.China has opened up free trade zones within its territory and attracting investments and equipment from Taiwan and Hong Kong.

10. These countries have stepped up their imports of finished leathers to overcome the growing restrictions on tannery pollution.

The relatively low cost machinery for , footwear and leather goods from these countries find increasing market in India.

5.2 India's Wage Advantage

In leather industry, India still holds greater wage advantage compared to other countries. Against 20 US dollars per day in South Korea, 50 US dollars in Europe/USA,

15 US dollars in Taiwan and 3 US dollars in PR China, the wage level in leather industry in India is hardly 2 US dollars. Strong raw material base coupled with vast reservoir of skills is an asset that can attract collaborative ventures in the field of sports shoes, machinery fabrication with overseas partners from Asian and other industrialised countries too.

6.0 Gulf War

Although shortlived, gulf war has left its adverse imprint on the economy and trade of many developing countries that depended on the imports of oil for their energy requirements.

1. India heavily depending on gulf oil had no other way except to restrict its consumption that contributed to the deceleration of its industrial activity.

2. Its exports (including leather and leather based products) were affected due to curtailment of cargo carriers during the war.

3. The exports to gulf countries were suspended. Hardly 2% of our leather exports (including products) enter the gulf countries in normal years. During the war period, exports were suspended. Further the exports to West Europe declined on account of fall of tourist trade into this market from gulf countries.

4. Further,the war demonstrated forcefully, that with technological supremacy, it would be possible to ruin the economy of any country/region in a short and swift war when that particular country opts to settle its international issues by force.

7.0 Conclusion

From the analysis of global changes sweeping the world, the issues relevant to India's export trade are as follows:

1. The leather industry at global level is fast shifting from industrialised countries of Europe and Americas to countries of Asia and South America where the low cost

labour and raw materials are available and where pollution regulations are not that much strict.

To enhance its share from the present level of 3% in the global trade to 15 to 20% by 2000 A.D. what strategy India should follow both in its production programmes and export trade? How to promote trade within Asia? In what lines complementarities can be explored with South Korea, Japan, Taiwan and P.R.China?

2. How to enhance the share of fashion oriented high valued products in preference to low valued products of mass production for exports?

3. Whether the existing trade policies have strengthened competitiveness of our products and helped in the full realisation of the unit value of the exports or whether they have encouraged the transfer of benefits to the imports? If the alternatives are imperative, what are they? "No duty on imports and no incentives on exports" will be an alternative?

4. How to capture the integrated E.E.C. markets? Is it possible for the small scale units to undertake bulk orders or is it imperative to encourage the trade agencies to fill the gap or farm out consortiums? Is it feasible to think of Whether joint ventures in the fields of sports shoes, footwear components/auxiliaries, machinery are necessary? If so, who will be the counterparts and how to encourage? If not why is it so when such ventures are flourishing in other Asian countries?

5. In the short run, the East European market is uncertain and one cannot foresee how the developments will take a shape. However, from the long term point of view will it be desirable to promote Indian enterprises in Eastern European countries? If so, how to promote them?

6. As at present the Indian industry stands and stares at the global events taking place. What measures are necessary to to foresee the events and help it to overcome the problems in advance? Is there any need to institute futurology studies and professional market research in this context?

SESSION II

Development of Leather Industry in the Rural Sector

DEVELOPMENT OF LEATHER INDUSTRY IN THE RURAL SECTOR

Kamal Taori, IAS
Chief executive Officer
KHADI AND VILLAGE INDUSTRIES COMMISSION, BOMBAY

1. HISTORICAL BACKGROUND OF RURAL TANNING & MARKETING:

Rural tanning industry is as old as civilisation. Mention of leather is found in "Rigved" and "Ramayana". Lord Shiva has been depicted using leather for covering body. Deer skin was used as "Asana" for meditation by saints. In ancient times leather was being used for covering body, for the purpose of protecting the body from heat and cold. Leather was also used as household materials, in agriculture, in irrigation, as ornaments, as musical instruments, harness and saddle in peace and war.

In ancient days according to information available, the art for preserving raw hides and skins preventing it from bacterial attack and decay, was being practiced - first process was perhaps sun drying hides and skins followed by smoke tanning, oil tanning and vegetable tanning.

The modern age of leather industry started with the introduction of vegetable tanning, using various nuts, leaves, barks containing tannins. This was followed by introduction of mineral tanning (mainly using basic chromium sulphate). Till the first quarter of 20th century, tanning industry in India was mostly being carried on in rural sector. With the introduction of mineral tanning using power operated machines as well as change in market requirements (for leather products) mechanised tanning units started coming up in selected urban cities mainly during and after First World War. Despite concerted effort of business houses to develop mechanised tanning industry, specially in urban areas, over 70% of the tanning is still carried on in rural areas of the country. Prior to introductin of tanning industry in the urban cities through mechanised units, production as well as marketing were being carried on in rural markets generally on barter system. This prevailed till beginning of the current century. The leather artisans used to get the raw hide/skin free from its owner on the death of the animal and used to supply him in turn the owner's requirements of leather items free and remaining surplus was sold by the artisans generally by the barter system as mentioned earlier.

2. Since time immemorial, as mentioned above, making of shoes, leather goods, tra velities, agricultural and irrigation equipments, ornaments, musical items and containers for carrying water, oil etc. was going on. Initially hides and skins of wild animals which were killed for the purpose of meat were used for making utility items required by the society. With the advent of civilisation, Animal Husbandry's activities developed which increases supply of hides and skins being the by product of animal husbandry activities (milk and meat being the main products).

3. This ensures coordinated growth and multiplication of the industry where from beginning to end linkages were provided by the local people for local use, based on local skills.

4. **HOW DECAY STARTED :**

a) **Feeling of inferiority complex attached to the trade;**

Rural tanning was being carried on in a manner which was less sophisticated and comparatively unhygienic and unclean than the mechanised tanning process. This difference of working condition, technology etc., is responsible for creation of developing a sense of inferiority complex among the artisans engaged in rural tanning. The society as a whole also developed on unfavourable attitude towards this segment of artisans who were engaged in rural tanning industry.

b) This is the beginning of discouraging rural tanning industry on the part of society and may be termed as first reason of decay.

c) Viable big tanneries around cities became more attractive and subsidised. Setting up of mechanised tanneries adopting improved technology and locating such units around cities having various infrastructural facilities, made these mechanised units more economically viable which could attract entrepreneurs, through which they could earn considerable profit. The hidden subsidy provided to such ventures which were located in or around cities also helped to make such units economical more viable. (Supply of water, power, removal of wastages by local bodies/State agencies, easy communication system and easy approach to market as well as for procurement and disposal of raw materials and finished products are available at the expenses incurred out of public exchequer and as such can be termed as subsidy).

d) **Better finish and low costs:**

The mechanisation helped tanning industry to import better finish and cut down the cost of production per unit. The decentralised and dispersed nature of tanning and marketing could not cope up with highly aggressive sophisticated urban tanning. Thus, gradually their dominant role in the country's leather industry was lost.

e) Decentralised and dispersed nature of traditional tanning and marketing could not cope up with highly aggressive sophisticated urban tanning.

f) New and new departments came forward to do extension work but confined themselves only to making facilities and services available through these clusters.

g) Incoming of plastic and synthetic rubber, nicely packed and comparatively cheaper and ready availability reduced demand for leather.

h) Organisations like KVIC which took pride before independence and immediately after independence for some time, in attending to the needs of these industries as service, subsequently confined itself only to distribution of grant, rebate and utilising highly subsidised money.

i) Multiplicity of new organisations to render services to the same cause and lack of interaction and coordination between them failed to yield desired result expected from such organisations.

5. **Our experience:**

i) KVIC had 121 tanneries in 121 villages in 1960 and today(in 1989-90) the figures are 212 (in addition to 32,697 individual tanning units).

ii) KVIC had following types of schemes in these last 30 years and the following amount has been paid on different activities:

A. **Scheme of KVIC under Leather Industry:**

1. a) Flaying Platform
   b) Ordinary Flaying Centre
   c) Intensive Flaying Centre
   d) Bone Crushing Unit
   e) Assistance to Family Unit of Tanners

f) Wet Blue Tanneries
g) Vegetable modern tannery
h) Self employed Cobblers
i) Family units of Individual Cobblers/ Leather Goods Artisans
j) Footwear and Leather Goods Units
k) 'A' type Footwear/Leather Goods Shop
l) 'B' type Footwear/Leather Goods Shop
m) Charmashilpa for Metropolitan Cities
n) Raw Material banks.

2. **Total investment by KVIC under Leather Industry:**

a)	At the end of 1960-61	Rs. 2.04 crores
b)	At the end of 1970-71	Rs. 6.43 crores
c)	At the end of 1980-81	Rs. 21.50 crores
d)	At the end of 1989-90	Rs. 80.26 crores

3. **Need to coordinate the different agencies:**

a) Agencies like DRDA, Harijan and Social WelfareDepartment, State and Central Leather Development Corporations, Animal Husbandry Department, SSI, NSIC, UNDP, ILO, KVIC, CLRI,STC etc. are the organisations working simultaneously for development of Leather Industry in the country. To ensure maximise the benefit, it is required to integrate and coordinate the efforts of these organisations so as to make sure that desired objectives are achieved.

b) In addition to above, good number of voluntary organisations like institutions, Federations and individual beneficiaries are engaged in this field. Working and efforts of these organisations are required to be coordinated with the first group of organisations who are assigned to plan and deliver the goods whereas the 2nd group of organisations are to work in the field level and implement the scheme.

c) **Training** :

Training is an important input for development of rural tanning industry in India. Though the country is blessed with large number of traditionally trained artisans, they need skill upgradation according to change in

production technology as well as change in market demand. This part can be best attended to by KVIC, KVIB having considerable organisational penetration supported by CLRI for technical inputs, DRDA, Harijan and Social Welfare Departments, financial institutions like NABARD, SIDBI for financial input.

d) **Marketing** :

No production activity is complete unless it is linked with effective marketing system. Establishing marketing linkages with organisations like voluntary institutions, Federations, Industrial/Expert Marketing Agencies/Organisations and S.T.C. will be the solution.

e) **Export** :

Though immediately prospect of penetrating in export market is not bright, but with well planned efforts, modernising the production techniques without replacing hands but by improving its skill and by providing better tools, raw materials, standard accessories etc. it will not be difficult to penetrate in export market in significant manner in respect of value added leather products like footwear, leather goods. Association with S.T.C. CLE, and establishing direct linkages with major export houses as well as foreign markets will help in achieving this objectives.

f) **Unknown areas**:

With significant improvements in rural tanning industry, which will ultimately influence positively value added leather products, will definitely unnerve the group which were exploiting the artisans and situation. With a view to avoid confrontation, complementary planning will be required to formulate by which various sector will find it beneficial to work jointly for each others benefit. Adopting such strategy, inter sector conflict between the different sectors can be avoided for the benefit for all.

4. **How and What to do?**

(A) Identification of pockets/locations where

a) Raw materials are available in adequate quantity.

b) Infrastructural facilities like power and water supply, suitable space with appropriate drainage facility for disposal of tanning waste, communication, transport facilities etc. are available.

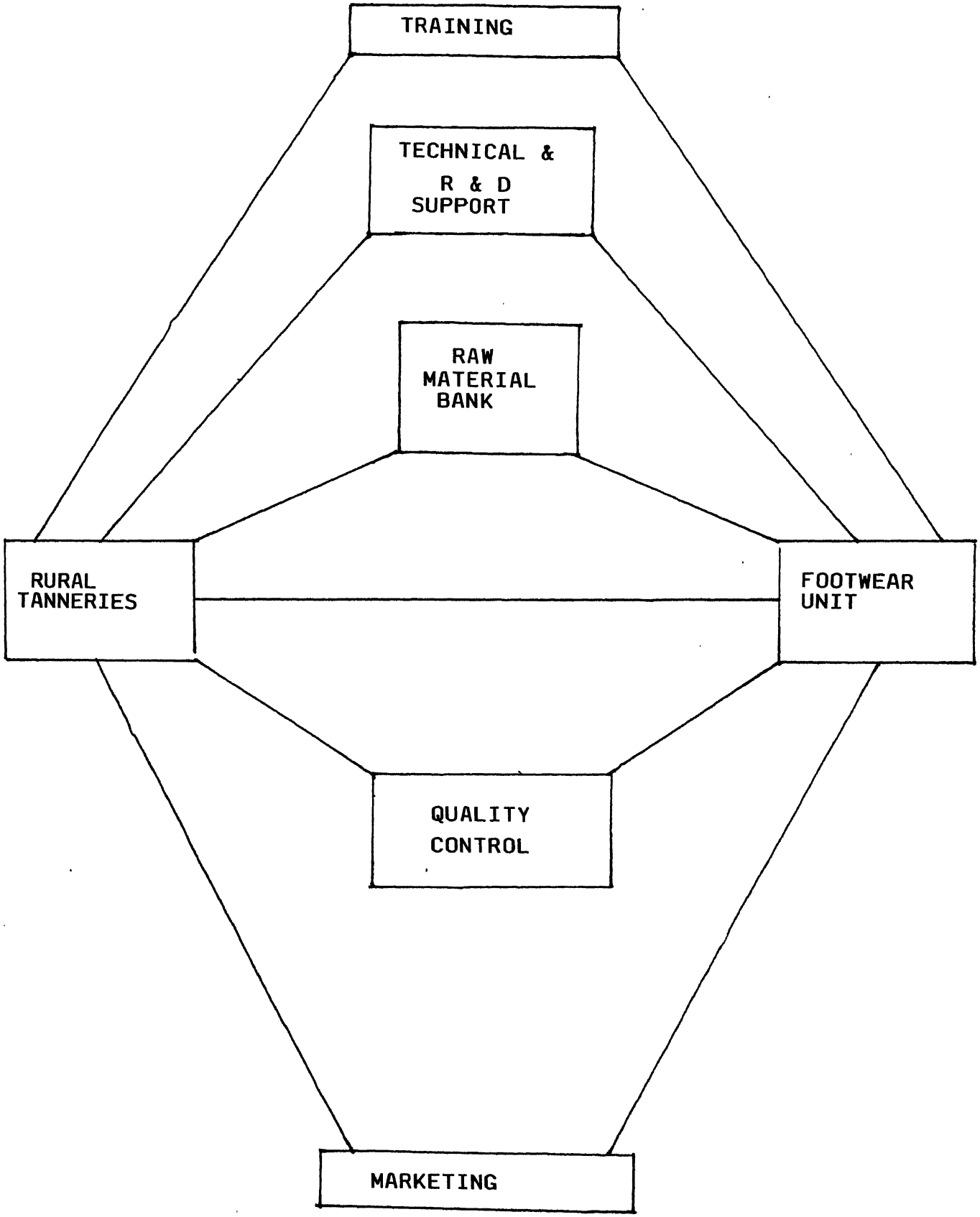
c) Such locations are to be selected where need to create employment generation scheme exists and

d) Locations are to be selected where skilled traditional artisans are available or where such segment of population inhibits generally.

(B) To achieve success for rural tanning industry and to make it more economically viable, it is necessary to coordinate with other likeminded organisations in terms of financial resources, infrastructure, technology, marketing, evaluation and for conducting follow up action like studies.

(C) With a view to maintain steady progress of rural tanning industry, it will be required to carry out SWOT analysis, to establish linkages and to persuade organisations/agencies implementing this programme to adopt zero based budget system, showing cost benefit analysis of the programme as well as adopting MIS through computer.

(D) Ultimate success of rural tanning scheme depends on institutionalisation of programmes in terms of training, funding, production and marketin, individual entrepreneur engaged in this activities are required to be linked up with institutions for the purpose of extending technical inputs, R&D Supports, quality control, processing and finishing facilities,conversion of Leather units value added leather products with required inputs like market trend, design, product mix information, extending facilities like availability of quality and standard accessories raw materials etc. and ultimately marketing support.


TRAINING
TECHNICAL &
R & D
SUPPORT
RAW
MATERIAL
BANK
RURAL
TANNERIES
FOOTWEAR
UNIT
QUALITY
CONTROL
MARKETING

5. Administrtive system to achieve the objectives in a reasonable period of time and the advantages which will **accrue in the process.**

Many state agencies, mention of which has been made earlier, are assigned this job. Some are doing commendable job, some are not. But individually all these agencies have their own limitations, financial,organisational as well as infrastructural.

But if the resources of these agencies are integrated, by pulling together the resource and strength of such agencies in effective manner, it is possible to achieve positive and substantial result.

To make this integrated approach possible, coordination agencies are to be set up at central and state level specifying role of each one, identifying every ones contributions and role for implementing programmes, including monitoring. For this purpose, State Coordinating agencies under the Central Coordinate Agency will finalise action plan for respective jurisdictions and ensure field level coordination, implementing the scheme through individual entrepreneurs, institutional agencies (beginning from training to marketing) and will also tackle problems, if any, of the field level implementing agencies, institutions or individuals.

Formulation of Bankable schemes, modifying the same from time to time, supervising the availability of important inputs sources, including financ, will be the major function of such central and state level coordinating agencies. Since this will be represented by the major stage agencies assigned this job, unresolved problems of field, if any, whether financial, or technical or marketing, will be attended and solved.

6. **Existing policies of State and Central Governments**:

All State Governments have initiated action to remove tanneries away from urban limits or earmarked areas for conducting such activities in cases of existing tanneries with facilities of tannery effluent treatment plants. Setting up of new tanneries are not allowed. Obtaining clearance of State Pollution Control Boards for setting up tanneries have become obligatory under Central anti-pollution act. Location of tanneries requires facility of tannery effluent treatment plant. As such, location of rural tanneries in areas not inhabited will be easy.

7. **Source of funds:**

i) Objectives of rural tanning is obviously to provide employment to rural artisans thus avoiding migration from rural areas. This will need skill upgradation of traditional rural tanner artisans by organising suitable training scheme for such artisans which is to also take care of product developments according to market demand; while these aspects are ensured, economical and bankable schemes for implementation in rural India will be posssible to formulate and thus rural tanning schemes are to be implemented through bank finance. These schemes will include vegetable tanning, Wet blue tanneries and whereever found necessary, finishing units will also be set up whose role will be like mother unit and which will process semi-finished products of wet blue and vegetable tanneries, according to market demand.

ii) The following additional incentives are offered to utilise and obtain bank finance:-

a) Interest subsidy certificates will ensure availment of bank finance @ 4% interest p.a., these are issued in advane, for 2 years in favour of lending banks. This facility of interest subsidy is available for 5 years against certificates that will be issued in subsequent years by KVIC.

b) A long term action plan for backward and forward linked activities can be worked out with the institutions which will be associated with this scheme like KVIC, KVIB, DRDA - Harijan and Social Welfare Organisations, Leather Development Corporations, institutions (engaged in flying schemes, tanning and footwear/leather goods manufacture) SSI, NSIC, UNDP, ILO, etc.

c) Since such schemes are to be implemented by the rural artisans, effective MIS is to be followed taking care to minimise paper work for which relevant format is to be formulated and used, computerising the same.

RURAL LEATHER INDUSTRY - PERSPECTIVES AND PROSPECTS

P N Chowdhury
Chairman, West Bengal Khadi and Village Industries Board

The unprecedented spurt in value addition during last few decades in leather and leather goods industries in India has been the result of an orchestrated functional coordination in policy- making, programme planning (both at macro and micro level), bold action plan, and commitment to an enlightened self-interest. Based on an export figure of more than rupees two thousand crores in 1989-90 there is an expectation that the same would soar upto Rs.1,00,000 crores at the end of the century; an unprecedented challenge to Government, Industry, suppliers of hide and skins (including small and unknown flayers in the countryside).

The export led growth has many assumptions and it may not be a cake-walk to achieve this very ambitious target.

The present paper deals with one of the dimensions of this tremendous enterprise of earning a colossal amount of foreign exchange i.e. the role of rural leather and anciliary industry in this development.

The spectacular development of leather and leather goods industries including footwear has been conditioned by a revolutionary change in chemical industry along with improvement in the supply of tanning materials. But the group of industries badly needs the building up a spectrum of skill and machinery. Above all, leather is a material - intensive industry and the prime place for its programme of development is always accorded to the optimum procurement, preservation and primary processing of raw hides and skins. Of late, the improtance of social compulsion of preserving the ecology and environment has received uppermost attention by the public and policy maker. Moreover, it is well-known that developed countries are gradually shying away from performing wet-work and transfering speedily the whole gamut of leather processing to the developing countries which have always remained as the colonial periphery of metropolitan industrial centres.

Another important desideratum which is commonly missed is that there is some inherent contradiction between earning foreign exchange and generation of additional income and employment. For enhancing export if you concentrate on highly sophisticated, high valued items in leather and leather goods, the technology component

in terms of chemicals, design know-how and top grade selection of hide and skins are relatively more involved. Of course, this process will bring in more foreign exchange. But, this may replace some semi-skilled and skilled labour and moreover, the income distribution from sophisticated production will be highly skewed; few operaters will grab a lot while a large number will receive less and less. Of course, some still fondly clings on to the view point that Development is born out of inequality and breeds further inequality.

As already stated above, the major stake in the accelerated progress of leather industries, as such, lies in the procurement, preservation and primary processing of hides and skins. Everyone knows that bulk of cattle hides (nearly 90%) flows from countryside and the percentage of skins supply is nearly 30-40% from the rural and rural-urban areas. As they are transported to far flung and a few organised centres in raw condition some 30 to 40% water is carried in transport causing, thereby, a huge material wastage of scarce supply of diesel and petrol. The normal putrefaction due to haulage under extreme heat conditions and the abrasions due to carefless handling tend to reduce the value of raw material. The wanton squalor, filth, pollution, degradation, crowded human concentration in and around urban tannery present the most dismal picture of 18th century industrialisation. Few big tanneries have already been condemned for polluting the Ganges water. Calcutta in its 300 birth centenary is to be reborn freed from smell, dust, and atmospheric pollution originating from a stretch of two square kilometers of tannery town endangering the health and hygiene of millions. The situation is explosive. Very soon it will receive great resistance from people, at large. We are condoning this grave situation, in as much as, we are all great lovers and votaries of leather!.

At this juncture, it will be necessary to pose some pertinent questions. Is it possible to reach the export target of Rs.10,000 crores without undergoing a plan for basic reorganisation in the location of tanneries and leather goods units? Is it possible to preserve the quality of raw hides where the preservation and haulage to a distant urban centre has been tortuous, wasterful and time consuming? Is it economically gainful and morally justified to deprive a large section of rural producers of hides and skins from the benefits accruing from onward march of the industry? Is it safe to put all our eggs in the export basket, in view of the possible fluctuations of international market? Each question, by itself, may be the subject matter of a wide debate but I intend to take up one or two of them.

Firstly, considering the rural and semi-urban flayers, and butehers, small traders who as primary producers of hides and skins have kept the trade alive through vicissitudes as positive factors of growth. They hail in millions from the most downtrodden segments of the society and form an important target beneficiary group for poverty alleviation and

developmental programmes. They require no sympathy but active faternal support by way of financial, organisational and intellectual assistance. They should be considered as equal partners in production. Conscious, organised and a viable production system should substitute for patronising do-good attitude of the top echelon of the society.

Secondly, the process of organising this community appears to be baffling but not an impossible task. The situation smacks out of economic deprivation, social segregation and utter demoralisation and want of confidence in life. The community is scattered, lives in isolated villages around agricultural population and, more often than not, works contractually with the owner of the livestock population or with the Panchayat for strengthening individual competitive strength. Their apparent saviours but real adversary is the traders who spread their network in and through the remotest corner of the villages and more often than not keep, the flayer and butcher in perpetual bondage through his superior economic might an tries to buy cheap from the flayers and sell dearer to the tanner. Socially speaking, the system makes the trader most dominating but a drag on development. Gradual downgrading the strength of the trading community, as such, in raw hides market and establishement and a direct rapport between rural producer (flayer and butcher) and organised tanner, improve (i) the bargaining position of both in the absence of middlemen, (ii) reduces the deterioration of raw materials and (iii) heightens the chance of productive cooperation through division of labour between tanner, on the one hand, and flayer/butcher, on the other (iv) reduction of trade margin followed by an increase in the share of value-addition among productive partners, i.e. flayers and tanners.

This unity seems to be the cornerstone of the success of leather industry. But the flayers are scattered in lakhs of villages.

Until now an attempt has been made to state the "why" of rural tanning and leather industry, now the "how" part of it will be elaborated. Village tanning is mostly area-specific suiting to peculiar resource disposition of a block Panchayat/Taluk. But the present model will be erected to make the programme of rural tanning as general and broad-based as possible. the recent experiences earned by the Centre of Technology and Development (New Delhi) under the technical guidance of Central Leather Research Institute designing the model and applying the same to the net-worked and appropriate technology-based tanning and footwear units in some parts of rural India involving the artisans in the field serves as an important input in constructing a theoretical framework of the model.

The conceptual framework of the proposed model veers round the following basic tenets :

A. Any rural tanning unit should be specific to an area and draws raw hides and skins from within a territorial ambit of, say 20 - 30 kms. The availability of local resources and skins, thus, puts a ceiling to the installed capacity of the production unit. The soaking capacity in a blue-chrome rural tannery of the contemplated design may not generally exceed 20 hides/40 skins per day.

B. The size of the unit should be adjusted to the (i) need of economic viability, (ii) the possibility of miniaturing the tanning machineries and equipments and (iii) the limitation of local market. The Indian rural market for leather footwear and leather goods broadly reflect two broad regional patterns. (1) North-East, North and North-West Sectors of the country which because of climatic and economic reasons provide wide market for output of rural tanning and finishing units, (2) Rural Leather Market is conspicious by its absence in South, East and Central parts of India, as a result, collective artisinal tanning units have to be integrated with some network of marketing system which extends through rural, rural-urban, urban-rural and fully urban area (c) As the production unit remains under the direct ownership and control of the flayers, the procurement of required hides may not pose a great problem. Local processing tends to enhance the price for primary producers of raw hides and skins. The time gap between flaying and initiation or pre-tanning processes gets reduced leading to optimum utilisation of raw resources.

So the model of artisan level tannery is shaped on low capital intensity (to intensify the repreducibility of the model), intimate artisan association, utilisation of local resources and obtaining local market, as far as possible. (D) Another distinctive feature of this model is the concept of networking which is pervasive through out different levels.

Level I : Territorial Interlocking

The command area of a tanning unit has been conceived as 25 km. There may be approximately 100 villages and say, 50 to 60 thousand population in the area. Villages are of different kinds and sizes in terms of population and concentration of economic activities; some are small and some are big; some villages have all infrastructural facilities like water supply, road, railways, electricity, educational, health facilities and others are not so fortunate.

The flow of the raw hide and skins culminating through different stages (1) hauling of dead animal to a dung- hill/slaughtering operation (ii) flaying the hide/skins (iii) preservation and curing through salting and other means (iv) primary processing - pre-tanning and tanning operations follow distinctive pattern of big-small village economic structural relationship. The location of a tanning unit should be decided on the

understanding of interdependant operations as mentioned above at different village configurations.

The model depicts above the backward and forward linkages of hides and skins processing; the model states (i) that there are two post - preservation routes one through the rural tanning units, another through trade channel - a movement towards urban organised tannery, moreover, a feedback of this stage purports. Once, the direction of raw hides (rural processing or urban transit) is decided. The techno-social structure of preservation will take shape. That means, in the former case, there may not be need of salting at all; transportation in rural mode will do; preservation time and cost will be low; in the latter case, other more elaborate measures will follow.

The output of tanning process may be sold either in rural or in urban market; of course, tanning process, itself is subordinate to the nature of output required in urban/rural market. The feed forward and feedback at every step decides the nature of detailed planning and evaluation.

Another important characteristics of the systems flow is the representation of network starting from carcass recovery down to footwear and leather goods production. A rural production unit having this interdependence among various resources will be most viable as the external dependence of the system will be minimal.

In conclusion it may be stated that -

(a) the expansion plan of leather, leather goods and allied industries in India may be fructified only with definite priority for the village sector.

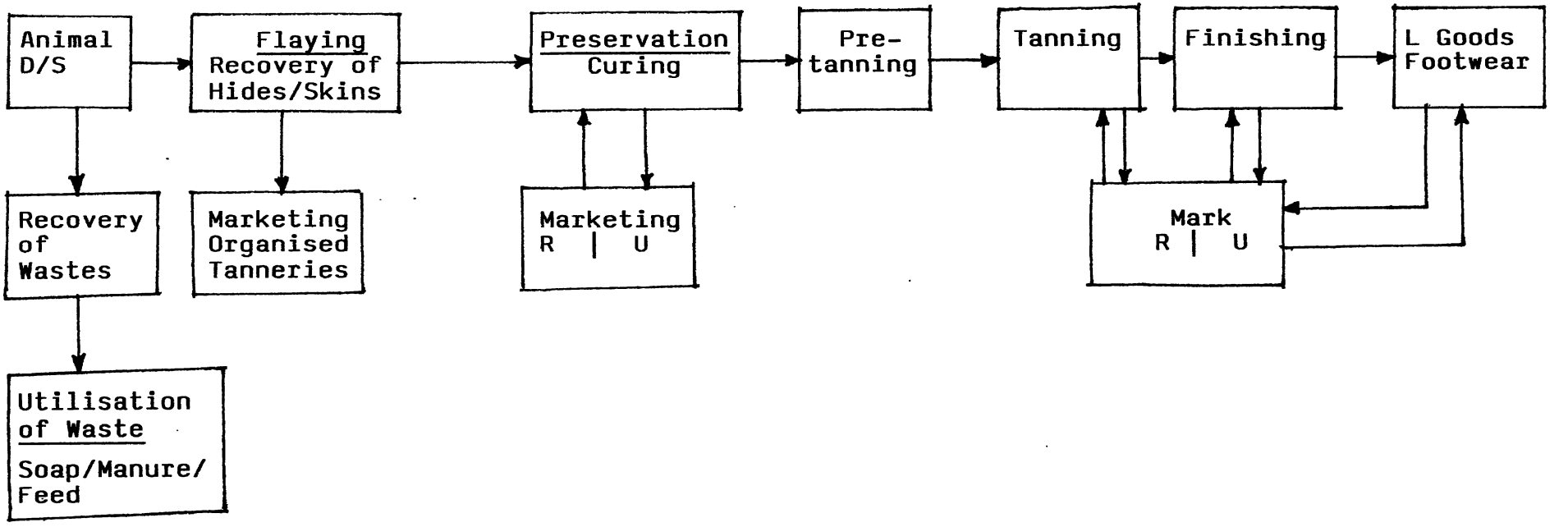
(b) the village sector should receive not only funds but an all out comprehensive planning should be made taking into consideration the network organisations structure, technology, marketing and an interdependent relationship with the urban organised sector.

(c) a plan for technology intervention adapting process, machinery, equipment and for that a suitable R D D should be drawn up.

(d) the rural leather development should be integrated with other developmental projects of a Panchayat block or a district plan.

LEVEL-II

SYSTEMS FLOW BACKWARD AND FORWARD LINKAGES



Note

Mark	.....	Marketing	R	.....	Rural
D	.....	Dead	U	.....	Urban
S	.....	Slaughtered			
Feed	.....	Poultry food and Manure			

AN APPROACH TO INTEGRATED DEVELOPMENT FOR LEATHER AND LEATHER PRODUCTS INDUSTRY IN THE RURAL SECTOR

T S K MAHADEVAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

Introduction

The leather industry is an ancient one and its beginnings are shrouded in the midst of antiquity. There is no record of its origin and hence leather is ageless and yet it remains modern and has undergone continuous changes due to the technological developments taken place all over the world. Its origin dates back to pre-historic times and the leather is considered to be a nature's gift to man-kind. Leather remains unmatched and hence it does not have any real synthetic substitute.

The basic raw material for leather industry namely the raw hides and skins are obtained as a bye-product of the meat industry. Understanding and interpreting the basic structure of the leather substance - collagen and its reaction mechanism during process of tanning has been the delight and despair of even the top scientists of the world. Yet the process of tanning continues to be simple within the capabilities of the illiterate or semi-literate rural tanner. This coupled with the skill of the village cobbler/artisan provides scope for the production of a wide range of utility articles to the mankind.

The Rural Bas

Though the leather industry is dispersed in almost all the seectors, originally the leather industry started as a rural base industry and even to-day it continues to have its roots in the rural sector in almost all the developing countries despite the many developments that have taken place in course of time. Farming being done mostly in rural areas, the raw hides and skins are essentially of rural origin obtained as a bye-product of the meat industry. The art and science of converting the above bye-product into an useful fabric for human use is known as tanning. Academically, the tanning is defined as the process of imparting resistance to purification due to bacterial action. Oflate the leather industry has shown a distinct shift towards the organised sector in urban or semi-urban areas due to many reasons such as mass production, increased mechanisation, impact of fashion trends etc. Originally as one of the main rural based industry, it used to provide livelihood to a large section of rural population but presently the number of beneficiaries in this sector are fast diminishing.

The process of tanning has now undergone various changes and developments transforming itself from a mere rural based craft into a sophisticated technology involving even computerised programme control mechanisms in some modern units. This has led to an increasing tendency for the migration of the rural population to urban areas leading to over crowding in the cities with all the attendant problems. The rural people used to attend to agricultural operations also apart from professions like leather processing. The alarming rate of migration of the rural population to urban areas have upset the essential needs of the rural based sectors like agriculture and farming.

The need for survival of the rural leather industry sector

The leather industry continues to be viable in the rual sector also just like the electronics industry of Japan. The rural sector has a definite and positive role to play in the development of leather industry. Various aspects involved in introducing an integrated approach for the development of the rural sector leather industry is worth a critical discussion. The advantages of the rural sector are the low cost of labour, fuller exploitation of the local resources and in addition the possibility of attending to the rural basic needs like agriculture and cattle farming. There is an urgent need to reverse the urban migration by reviving the rural based industries. The leather industry being essentially a rural oriented one is an ideal avenue for immediate attention as this provides sufficient scope and viability such as animal farming, dairy products, meat production, utilization of slaughter house bye-products including tanning and leather products manufacture, etc. The need for collection of the carcasses and dead animals, proper maintenance of slaughter house and organizing a correct method of flaying technique, etc., will go a long way in providing for the production of basic raw material namely hides and skins. Preservation and curing of the hides and skins for a sufficient length of time is a prime requisite which can be carried out in the rural sector as an ideal base. The village tanners have the ability to provide a reasonably good leather by utilising the locally available materials for making products of daily use in this area. The rural tanned leathers can beprofitably converted into useful products like footwear, utility articles and even fancy articles for serving the interest of tourists visiting the interior country side. Taking a realistic view of the vast potential for the development of leather industry in the rural sector, it becomes clear that there is a strong case for the survival of the leather industry in the rural sector because of various factors.

Slaughter and Flaying

The rural village panaroma offers an ideal setting for the raw material production when properly organised. The rural village can serve as basis for the p0urpose of the production of hides and skins providing employment to the rural butchers and the flayers.

But there is a need for organizing the slaughter house in certain strategic areas to serve the needs of a group of cluster of villages as a meat production centre. Establishing a hygeinic and well planned slaughter house in such a central point for a group of villages will enable the production of meat in more hygeinic conditions and will enable the utilisation of all the bye-products which will incidentally help in reduction of cost both of meat and hides and skins. By providing employment to the rural butchers and flayers, the tendency for migration of the rural artisans to urban areas will be discouraged.

Tanning sector

The main problems of the rural tanning sector are the non- availability of the basic raw material at rasonable cost, growing competiton of the organised sector, processing time being very long, limited skillforadopting more modernand sophiticated process, inability to stock adequate chemicals and accessories needed for modern processing and very limited capital inputs as may be needed for installation of machines and other equipments to remove the drudgery. In addition, the lack of adequate knowledge of the tanner in modern procesing techniques and lack of exposure to modern concepts in tanning act as other inhibiting factors. Yet anothr aspect is a limited market potential for these rural tanned leathers near the surce of production. Above all the inability of the rual tanners to bargain for a higher price, since marketing is invariably done by rural tanners through middlemen who may take the advantage of the situation and profit. Nevertheless the rural sector has certain inherent advantages such as proximity to production centre of hides and skins, the possibility of using locally available tanning materials for vegetable tanning and a limited local demand for low cost leather products. Even if male members are engaged in agriculture or otherwise, the other family members including the womenfolk can look after the tanning work continuously. If the rural sector has to survive, a planned approach is required to make the rural tanning practicable by providing adequate support like common facility centres where the Government provides all the needed machines on job work basis so that the rural tanner is in a position to upgrade the quality of leather without having to invest much money in machines. The common facility centre also enables the transfer of technical know-how for improving the quality of leather. The common facility centre should be located in such an area where it can serve the interests of a group of rural tanners so that there would be adequate work load in these centres. Adjacent to common facility centre, the Government can also think of building a number of small sheds where the individual rural tanner can do the tanning. Otherwise a group of tanners can also operate with their raw hides and skins. Very often it is seen that in the very place of living and habitation, tanning is also done, which is not hygeinic and hence not desirable. This will also enable the production of more sophisticated types of leathers even in the rural area which can cater to the more exacting demand of the product manufactures in the nearby areas.

Yet another field which has not received adequate attention is the scope for adopting the "hair on tanning" of animals like goat, sheep, cattle etc. The tanning technology is rather simple and is amenable for adoption in the rural sector and is within the capabilities of the rural tanners. The hair on tanned leathers can have a good demand from the leather product manufacturers, and some manufactures who can utilise these leathers for production of leather toys where in exotic designs which again is a craft oriented industry which will have quite consumer demand from the tourists and the affluent sections of the socieyt.

Leather product sector

The production of leather products in the rural areas appear to be on a non organised base and this deserves a systematic planning for giving a definite orientation towards readily saleable products. The products that are marketable in the rual areas can be classified under the following three categories:

1. Meant for use primarily in rural areas like open types of sandals which can be extended to some urban areas as well.

2. Cater to the tourists interest particularly in places which are recognised as toourist centres. The tourists often wuld like to cary souvenirs of the places they visit and the typical locally designed souvenir articles will be sold at a highly attractive prices. Usually the vegetable tanned leathers finished with tooling designs, beed work or embroidery designs attached on the leather cushions, key chains, will hangers, leather furnitures, etc. attract the tourists who are in a positiron to pay fancy prices. This has a good potential for commercial exploitation and the rural artisans can very actively be encouraged in this line of production. For this there is a need for organising the supply of leathers, adhesives and all other accessories with proper designs and invovle the local artisans to make use of thier leisure time for producing standard designs. These can be collected and marketed by a centralised agency at fancy prices.

3. The leather product sector can also serve equally effectively even in countries with low raw material base. The example of the development of the leather products industry in Korea is an ideal illustration. The raw material base for leather industry is reported to be sufficient to have only the requirement of 16 days production in an year. yet the leather product industry is booming by supplementing by importing the leathers from other ocuntries. The finished leathers required for the manufacture of a variety of products can be imported from abroad by the organised sector, who can in turn involve the rural sector very effectively utilising the skill and the deft

craftsmanship of the rural artisans who prduce leather products. There should be a system of centralised agency for planning of the design, procurement of materials, marketing and management, with a close link up with the decentralised production net work of rural production units of tiny nature. By maintaining a close liaision between the centralised planning agency and the decentralised production net work it will be possible to maintain a uniform quality, providing a comfortable living wages to the rural artisans without disturbing them from their permanent settlements. The tendency for urban migration of population will also be thus discouraged. The alternate system so devised and wroking successfully is also indicaed separately.

The Role of Rural Sector

For planning the development of leather industry in the rural sector, it may be relevant to make an analysis of the strength, weaknesses, Opportunities and Threats (SWOT Analysis) of this sector and device a strategy taking all these aspects into consideration. On a careful examination of these aspect these can be summarised as follows:

STRENGTH

- it provides a strong base for the production of raw materials.
- the availability of labour at low cost
- possibility of using locally available materials
- high skilled and craftsmanship ofthe traditional artisans
- Less hazards due to pollution and low overheads cost.

The dispersal of industries in the rural sector will also enabl ethe people to attend to other affairs simultaneously along with the basic work.

WEAKNESSES

- Lack of adequate literacy and training in the processing techniques and machine operaiton
- lack of exposure to modern developments taking place in their sectors
- the rural processing takes considerable longer time
- limited capacity of capital investment
- limited market potential locally and long distance from the consumer market

OPPORTUNITIES

- Good potential for growth
- greater flexibility of operations
- ability to serve as feeder or captive units to organised sector
- low level of taxation by the Government agency

THREATS

There is always a continuous danger of growing competion from organised sector who can mop up the entire raw mateial resources by paying more attractive prices; inadequate infrastructure, limited marketing ability, growing migration of the rural in search of employment more and cleaner industries and transport problems. These aspects deserve a careful consideration in planning the basic concepts for the development of industry in the rural aras of any country.Despite all the weaknesses and threats, they face from the organised sector, the rural sector has the inherent strength and advantage of the opportunities thus presenting an optimistic scenerio for the leather industry particularly because of its strong rural base. The basic concepts for the development of leather industry requires an integrated approach covering all aspects of the industry right from the collection of raw materials, improvement of the tanning techniques, rationalisatiorn of the product fabrication and marketing of the finished products. The basic objectives of such a programme are to -

- enable the maximum utilisation of the locally available resources
- obtain higher financial gain to the people concerned
- upgrade the level of technology and traditional skill
- ensure standards and quality of production
- reduce the drudgery of traditional practices and
- generate more gainful employment to the rural people.

On factor which needs speical attention is the manufacture of leather products at relatively lesser cost in more attractive designs emphasising the handicraft work and highlighting the artisans skills by providing tooling, beed work, embroidery, etc.

The development plans for the rural sector should have a flexibility of operation to adopt either the traditional way or it should be in a position to take up the alternate models in keeping with the changing times and the needs of the country as a whole. The conventional approach normally practiced at present leads invariably to certain competition between the rural and the organised sector much to the disadvantage of the rural sector. If this trend continues, there is a danger of total extinction of this rural

sector. In order to avoid this, it may be worthwhile to aodpt an alternate model to involve the rural sector as a complementary factor instead of being a competitive one for the growth of the organised sector to the advantage of both these sectors. The details of an alternate model suggested for the manufacture of leather prducts in the rural sector is presented in brief as folows:

Manufacture of leather products presents an ideal venue for adopting alternate model for the rual areas streamling the programme of the rural sector to the needs of the organised sector. The alternate model is based on the following principles:

- Centralised planning, management and marketing
- Decentralised production in the rural sector

The details of the alternate model suggested are as follows :

The Centralised Planning Agency will evolve proper designs which have a ready acceptability for the consumer market, specially, the high value items. This agency will procure all the necessary material inputs and distribute the components and accessories to a wide spread rural based artisans for fabrication as finished products. Finally they will collect the fabricated products from the rural sector and market the same in strategic areas to obtain maximum wages at a flat rate together with an incentive in commensurate with the quality and the quantity of production. The centralised agency will also provide the essential machines for sewing and skiving apart from supplying all the other accessories like threads, adhesives etc.

The rural artisans on their part will fabricate the materials supplied by the central agency according to the instructions and deliver the fabricated goods as per the specific time schedule taking care to manufacture products in conformity with the instructions. The advantage of this system is that the widely dispersed rural production units can work in their own houses, attend to their other basic needs and still earn their livelyhood on an assured basis. This sort of system will also reduce the overheads considerably and enable the combined sector to take advantage of all Governmental concessions for small units. At the end of the year the individual rural artisans will also get a share of the profits of the central agency. Thus both the organised and rural sectors stand to gain by such an approach.

The central agency in their own interest should organise periodic training of the artisans to upgrade their skill to ensure uniform quality of the products.

Advantages of the new system

By a centralised planning and procurement, the possibility of variations in the quality of raw materials, patterns, designs and other accessories will be minimised. The central agency need not invest in large infrastructure facilities like production sheds and face problems due to labour troubles and strike etc. The decentralised cottage sector on their part need not have to worry about developing a readily saleable design or pattern, or procurement of raw materials etc. as all these are supplied. The rural artisans do not have the problem of finding capital investments for the purchase of machines and stocking of raw materials. The rural artisans are saved of the burden of the marketing of the products. They are assured of living wages regularly and in addition they are able to get incentives according to their skill, capacity and quantity and quality of production. The central agency will have the option to buy and store the materials in bulk whenever the price is low and they can also withhold the sale of products to wait for an opportune time to get maximum sale value for the products. Both these aspects are not possible for individual rural artisans. There is an intimate relationship between the central agency and individual artisans with a dignity of equality and partnership. Both the partners will have a share of the profits made in the composite unit of the whole.

The centralised agency will also have the capability of developing the marketing net work over a wide area. This model will provide an ideal set up for the re-existence of the organised and disorganised sector spread over the rural areas.

CARCASS RENDERING

RECOVERY OF BYPRODUCTS

- COURSES MAY BE CONDUCTED TO TRAIN THE TRAINERS

- TOTAL ADDITIONAL INCOME GENERATED PER ANNUM AS PER ALL INDIA HIDES AND SKINS SURVEY IS Rs.583 CRORES AS PER 1986 ESTIMATES DETAILS ARE:

LOSS DUE TO NON-RECOVERY OF CARCASSES	- Rs.179 CRORES
NON-RECOVERY OF HIDES AND SKINS	- Rs..33 CRORES
LOSS DUE TO PARTIAL RECOVERY OF BYPRODUCTS	- Rs.371 CRORES

- PRESENTLY NO AGENCY FOR MULTIPLIER EFFECT

POSSIBLE AGENCIES

- KVIC & STATE LEATHER DEVELOPMENT CORPORATIONS

- CLRI CAN CONDUCT ONLY ONE OR TWO TRAINING COURSES EVERY YEAR EXPENSES TO BE BORNE BY THE SPONSORING AGENCIES

FINANCIAL SUPPORT - NEEDED

- CLRI can provide Technical know-how - limited funds
- KVIC/KVI State Boards - Can supply raw materials and chemicals
- For trainees - T.A. & D.A. - Training course materials and auxiliaries - Rural Development Agency like NABARD, Rural Development Ministry, D.S.T., C.T.D., etc.

IMPROVED METHODS OF CURING

- IMPROPER CURING
- USE OF OLD USED SALT
- QUALITY DETERIORATION
- POSSIBILITY OF PUTREFACTION RESULTING IN POOR QUALITY

CLRI CAN DEMONSTRATE IMPROVED METHOD OF CURING USING CHEMICALS/ BIOCIDES - TRAIN THE TRAINERS FOR MULTIPLIER EFFECT - CO-ORDINATING AGENCY TO BE IDENTIFIED - KVIC, STATE LEATHER DEVELOPMENT CORPORATIONS

NET RESULT

- QUALITY IMPROVEMENT OF RAW MATERIALS
- POSSIBILITY OF OBTAINING ADDED VALUE TO THE PRIMARY PRODUCERS

TANNING

(A) CONVENTIONAL APPROACH

(B) NON-CONVENTIONAL APPROACH

NON-CONVENTIONAL APPROACH

FUTURE PLANS

STREAMLINING (CHROME TAN) THE PRODUCTION IN RURAL SECTOR ON NON-CONVENTIONAL LINES TO MAKE THEM SERVE AS FEEDER UNITS, SMALL SCALE AND ORGANISED SECTOR. DEMONSTRATION OF PROCESSES AND TRAINING COURSES IN CHROME TANNING IN WET BLUE.

ADVANTAGE

SMALLER DOSES OF POLLUTION LOAD WITHIN THE CAPACITY OF NATURAL REGENERATION CAPACITY OF THE EARTH - AVOIDANCE OF HUGE ACCUMULATION OF HIGH POLLUTION LOAD AS SEEN AT PRESENT IN URBAN AREAS

Collaborative Agencies

KVIC, KVIBs, State leather Development Corporations, S.I.S.I., D.S.T., Centre for Technology Development, New Delhi.

Essential pre-requisites

- Establishment of raw materials and Chemicals Supply Banks
- Quality Inspection Agencies

LEATHER PRODUCTS

- TRAINING COURSES FOR ARTISANS IN LEATHER GOODS MANUFACTURE
- MANPOWER DEVELOPMENT CO-ORDINATION

COLLABORATIVE AGENCIES

- KVIC, STATE KHADI & VILLAGE INDUSTRIES BOARDS/LEATHER DEVELOPMENT CORPORATIONS

CLRI's CONTRIBUTION IN THE DEVELOPMENT OF LEATHER INDUSTRY IN RURAL SECTOR - AN OVERVIEW

T S K MAHADEVAN
CENTRAL LEATHER RESEARCH INSTITUTE, ADYAR, MADRAS 600 020

Background

One of the major objectives of the Central Leather Research Institute (CLRI), Madras, Which started functioning from 1953 is the development and transfer of appropriate technology to the leather and allied industries belonging to rual, small, medium and large scale sectors in the country. The Institute with the help of its five Regional Extension Centres in Calcutta, Kanpur, Jullundur, Rajkot, Bombay and base Unit has been serving the industry in almost all the States of the country through its Extension Wing. Conducting free practical demonstrations of the processes developed in the various tanning centres of the country is one of the main activities of this Area. Out of the total 2000 odd demonstrations carried out hitherto since 1958, more than 40% have been only in the rural sector. Inspite of the many constraints faced by the extension staff in the early stages of the field work in rural areas like the isolation of rural tanneries, the traditional indifference to changes, languages and dialects, long distances, poverty and illiteracy, doubts, fears, suspicions and prejudices, poor communication and transport, social attitudes, the Institute made the rural tanners in many pockets of the country to realise the importance of science and technology by "Seeing is Believing Method". Thus the Institute has the proud privilege of bringing science and technology to the door steps of the traditional artisan.

Review of the past work done

ACTIVITIES OF THE INSTITUTE IN RURAL SECTOR

The various activities by which the Institute has been serving the ruaral sector of the leather industry are:

1. Practical demonstrations of improved process in tanning, curing and preservation of raw hides and skins and utilisation of by-products in the rural units.

2. Training cum demonstration camps.

3. Collaboration with rural development organisations/Agencies/ Trusts/Foundations like the Khadi & Village Industries Board and Khadi & Village Industries Commission/Small Industries Service Institute for rural development of the leather and allied industry.

4. Integrated rural development work for processing leather and leather products in certain pockets in collaboration with other agencies like Institute of Management, Social Works and Research Centre, Design Centres and Banks.

5. Organising and participating in seminars and workshops.

6. Training of artisans in leather processing and machine operation.

7. Schemes and layouts (comprehensive scheme like living quarters, tanning sheds, common facility centres) for rehabilitation of rural tanners in certain states.

8. Trade Counselling and technical enquiries.

9. Priority and free service for rural tanners in their very doors whenever the Institute's services are required by them.

10. Covering the status of rural sector of leather industry and allied industry and including their suggestions for improvement in the various technoeconomics surveys carried out by the Institute in the various states on leather and allied industry.

11. Bringing out journals/periodicals in local languages like Hindi, Urdu, Gujarathi, Marathi and Tamil describing the processes.

12. Inviting a few rural tanners, free of cost from various regions to the Institute during the annual Leather Week so as to get them exposed to the importance of science and technolgy.

EVALUATION OF THE EFFECTIVENESS OF TRANSFER OF TECHNOLOGY

The evaluation of the effectiveness of the technology transfer in the leather industry poses many problems and more so in rural sector. There is no yardstick by which one can measure the benefit in terms of value. The acid test is the overall prosperity of the rural leather industry in the various pockets with which the Institute has been associated. The technology disseminated in the rural sector hasresulted in:

WITH BEST COMPLIMENTS OF:

KAPURTHALA NORTHERN INDIA TANNERIES LIMITED

Post Box No.18, Sultanpur Road,

KAPURTHALA : 144 601 (Pb.) INDIA

Grams : KNIT Phone : 01822-2545

Estd. : 1942 Contact Person : Mr G S Grewal, Executive Director

Branches :

i) KNIT BONE & GLUE WORKS, RAJPURA : 144 401

Grams : KNITGLUE Phone : 01762-2532

ii) KNIT BONE & GLUE WORKS, NILOKHERI (Haryana).

Manufacturers & Exporters of :

i) Vegetable Tanned Sole Leather, 'KNIT' Brand Flat Leather Belting, 'EXCEL' Brand Round Leather Belting, Double Oak Tanned Picking Bands, Spring Buffers, Buffing Wheels and Drawing Leather.

ii) Sheep Nappa (Garments Leather), Cow Calf Nappa and Upper Leathers for shoes.

iii) Crushed Bones, 'DUCK' Brand Bone Meals, Sinews, Horn & Hoof Meals and Sterilised Bone Flour.

WITH BEST COMPLIMENTS FROM:

INDIAN TANNING INDUSTRIES

Cable : WASHERS

Phones : 42786, 41408
261604, 43502
Telex : 325462 ITIK IN
Fax : 0512-211627 ITI

98/88, NAZIR BAGH
KANPUR : 208 001

TANNERS & EXPORTERS OF:-

FINISHED LEATHER, SHOE UPPERS,
LEATHER BAGS, CUTSOLE COMPONENTS
AND
ALLIED LEATHER PRODUCTS

Associates :
Indian Leather Industries
Indian Leather House

WITH BEST COMPLIMENTS FROM:

GOLDEN CHEMICALS LIMITED

Chromium House

Western Express Highway

Post Box No. 8204

Dahisar

BOMBAY : 400 068

Tel.: 653663, 653671, 653848, 653994

Telex : 011-70028 GCL IN

Gram : 'GOLDKEM' Bombay : 400 068

OUR PRODUCTS

* *SODIUM BICHROMATE*
* *BASIC CHROMIUM SULPHATE*
* *POTASSIUM BICHROMATE*
* *CHROMIC ACID FLAKES*
* *CHROME OXIDE GREEN*
* *SODIUM CHROMATE*
* *SODIUM SULPHATE ANHYDROUS*

HOMERA TANNING INDUSTRIES PVT. LTD.

¥¥

1-D, (17-A-1) 150, FEET ROAD
JAJMAU
KANPUR : 208 010
INDIA

Cable : 'LONGLAST' KANPUR
Telex : 325 358 RKSH IN
Phone : 42798, 42729, 43466, 252986

(All types of Finished Leather & Leather Products)

Associates:

1. Paramount Leather Product
2. Belting Corporation
   98/138, Purwa Hiraman
   KANPUR - 208 001

§ § § § §
§ § §
§

Leathers Of Distinction

with

Leather chemicals from

SM Zschimmer & Schwarz Chemicals Ltd.

Our speciality range includes

Wetting, emulsifying, degreasing & dispersing agents

1.	Activol	OLNS	—	High efficiency germicidal soaking agent, PCP free.
2.	Supralan	UFS (Conc.)	—	Degreasing agent for New Zealand pelts, solvent free
3.	Supralan	UFS(M)	—	Regular degreasing agent, solvent free.
4.	Zelon	NT 953	—	100% active, wetting, emulsifying and dispersing agent.

Versatile synthetic tanning agents

1.	Dolatan	CR	—	Chrome syntan
2.	Dolatan	DL	—	Dye levelling syntan
3.	Dolatan	NU	—	Neutralising syntan
4.	Dolatan	BL	—	Bleaching syntan (particularly suitable for E.I. Leathers)
5.	Novaltan	MR	—	Acrylic syntan

New generation fatliquors

1.	Pelgrassol	CS14	—	Lightfast, synthetic, for nappa and gloving.
2.	Pelgrassol	MBS Extra	—	Synthetic, for upholstery, softy uppers etc.
3.	Pellastol	ESS	—	Synthetic, ester – based for high quality soft leathers.
4.	Pelgrassol	LPS	—	Chrome and electrolyte stable synthetic fat liquor.
5.	Pelgrassol	SV	—	Vegetable based, for all types of leathers.
6.	Pelgrassol	SL	—	Nourishing fatliquor based on Lanoline for waxy touch.
7.	Pellastol	SF	—	Combination of fish oil and synthetic softeners for soft and full leathers.
8.	Pelgrassol	WWS-M	—	Semi-synthetic, non-ionic, with good stability & penetration.
9.	Pellastol	33NS	—	Sulfated natural oils with synthetic softeners for tight and supple leather.
10.	Pellastol	SXO	—	Based on synthetic softeners for all types of uppers.
11.	Provol	BAS	—	Versatile fatliquor based on phospholipids & synthetic softeners.
12.	Provol	LNE	—	Phospholipids and fatty alcohol esters for nappa & suedes.
13.	Provol	LES	—	Semi-synthetic, for light-weight & silky handle leathers.
14.	Alcosoft	CWS	—	Synthetic cationic fat liquor.
15.	Conol	ACS	—	Emulsified liquid hydrocarbon for grain softening & burnish leathers.

Exclusive resin binders

1.	Dermasol	S83	—	Soft, microfine polyacrylate for aniline finish.
2.	Dermasol	MS90	—	Medium soft polyacrylate for universal application.
3.	Consol	SM	—	Soft Acrylate for better covering.
4.	Consol	MS40	—	Medium-soft polyacrylate, for plate finish and C.G. impregnation.

Head Office

SM House,
11 Sahakar Road,
Vile Parle (East),
Bombay 400 057.
Tel : 6362694 (4 lines)
Tlx :: 011–79380 SMIM IN
Fax : 91–22-6344985